



Evon Silvia <esilvia@quantumspatial.com>

The intended type for LAS 1.4 ExtraByte min/max/nodata

8 messages

Evon Silvia <esilvia@quantumspatial.com>

Tue, Jan 26, 2016 at 11:09 AM

To: mrosen@lizardtech.com, sdharmapuri@mbakercorp.com, wpeng@esri.com, Arttu Soinen <arttu.soininen@kolumbus.fi>, Christian Sevcik <csevcik@riegl.com>, Christopher Parrish <Christopher.Parrish@oregonstate.edu>, David Reid <david.reid@optech.com>, Derek Morris <dmorris@geocue.com>, Gerhard Loeffler <Gerhard_Loeffler@trimble.com>, H Karl Heidemann <kheidemann@usgs.gov>, Howard Butler <hobu.inc@gmail.com>, Lewis Graham <lgraham@geocue.com>, Martin Isenburg <martin.isenburg@gmail.com>, Mike Umansky <mumansky@appliedimagery.com>, Paul Galla <paul.galla@leicaus.com>, Ramesh Sridharan <ramesh.sridharan@virtualgeomatics.com>

Hello fellow LWG folks,

I love that LAS 1.4 formalized the creation and storage of ExtraBytes. It's an amazing extension to the format, albeit incredibly complicated to implement from a programming perspective.

One detail I can't glean from the specification, however, is whether the min, max, and nodata values are intended to be transformed or raw values. I imagine that transformed values would be more meaningful to a lay user, but raw values seem to be the specification's intent (second paragraph, page 25 of R13) and more meaningful to the programmer.

For example, the "sigma xyz" value in the [Topo-Bathy LiDAR LDP](#) is stored as a uchar (u8) tuple, but when scaled by 0.01 as instructed it becomes a float. Supposing the maximum raw value is 150, the minimum is 22, and nodata is 255, what value should be stored in the min, max, and nodata fields?

Option 1: store raw values as unsigned long long integers (u64)

1. min = 22
2. max = 150
3. nodata = 255

Option 2: store transformed values as double-precision floats (f64) because the scale factor is valid (if it wasn't valid, they would be stored as u64s as before)

1. min = 0.22
2. max = 1.50
3. nodata = 2.55

Option 1 makes the most sense to me, but the specification is unclear whether it's referring to the transformed type or the stored type.

Thanks for your input!

Evon

--



Evon Silvia PLS
Geomatics Specialist
517 SW 2nd Street, Suite 400, Corvallis, OR 97333
P: (541) 452-8502
E: esilvia@quantumspatial.com

PS – Once there is a decision I intend to forward this discussion (or at least its conclusion) to Martin's "lasroom" forum for the public record.

Evon Silvia <esilvia@quantumspatial.com>

Tue, Jan 26, 2016 at 11:12 AM

To: mrosen@lizardtech.com, sdharmapuri@mbakercorp.com, wpeng@esri.com, Arttu Soinen <arttu.soininen@kolumbus.fi>, Christian Sevcik <csevcik@riegl.com>, Christopher Parrish <Christopher.Parrish@oregonstate.edu>, David Reid <david.reid@optech.com>, Derek Morris <dmorris@geocue.com>, Gerhard Loeffler <Gerhard_Loeffler@trimble.com>, H Karl Heidemann <kheidemann@usgs.gov>, Howard Butler <hobu.inc@gmail.com>, Lewis Graham <lgraham@geocue.com>, Martin Isenburg <martin.isenburg@gmail.com>, Mike Umansky <mumansky@appliedimagery.com>, Paul Galla <paul.galla@leicaus.com>, Ramesh Sridharan <ramesh.sridharan@virtualgeomatics.com>

By the way, Option 2 would be more consistent with how the XYZ min/max values are encoded in the LAS header. That's why I started scratching my head about this in the first place.

Evon

[Quoted text hidden]

Martin Isenburg <martin.isenburg@gmail.com>

Tue, Jan 26, 2016 at 11:20 AM

To: Evon Silvia <esilvia@quantumspatial.com>
Cc: Michael Rosen <mrosen@lizardtech.com>, "sdharmapuri@mbakercorp.com" <sdharmapuri@mbakercorp.com>, Wanning Peng <wpeng@esri.com>, Arttu Soinen <arttu.soininen@kolumbus.fi>, Christian Sevcik <csevcik@riegl.com>, Christopher Parrish <Christopher.Parrish@oregonstate.edu>, David Reid <david.reid@optech.com>, Derek Morris <dmorris@geocue.com>, Gerhard Loeffler <Gerhard_Loeffler@trimble.com>, H Karl Heidemann <kheidemann@usgs.gov>, Howard Butler <hobu.inc@gmail.com>, Lewis Graham <lgraham@geocue.com>, Mike Umansky <mumansky@appliedimagery.com>, Paul Galla <paul.galla@leicaus.com>, Ramesh Sridharan <ramesh.sridharan@virtualgeomatics.com>

Hello,

My original intention when I added the "min / max" values to the "Extra Bytes" struct was that their use would be identical to that of the min/max for XYZ in the LAS header. They are usually precise and give you enough info to compute, for example, your OpenGL view frustum but they cannot always cover the entire value range with full resolution, just like I can come up with scale and offset values so that $132 * \text{scale} + \text{offset}$ cannot be entirely correct be represented by the F64 in the LAS header.

Regards,

Martin

PS: Is there any LAS content online that uses tuples of attributes in "Extra Bytes"? So far I have only implemented support for storing scalar attributes with "Extra Bytes" in LASlib.

[Quoted text hidden]

Evon Silvia <esilvia@quantumspatial.com>

Tue, Jan 26, 2016 at 11:34 AM

To: Martin Isenburg <martin.isenburg@gmail.com>
Cc: Michael Rosen <mrosen@lizardtech.com>, "sdharmapuri@mbakercorp.com" <sdharmapuri@mbakercorp.com>, Wanning Peng <wpeng@esri.com>, Arttu Soinen <arttu.soininen@kolumbus.fi>, Christian Sevcik <csevcik@riegl.com>, Christopher Parrish <Christopher.Parrish@oregonstate.edu>, David Reid <david.reid@optech.com>, Derek Morris <dmorris@geocue.com>, Gerhard Loeffler <Gerhard_Loeffler@trimble.com>, H Karl Heidemann <kheidemann@usgs.gov>, Howard Butler <hobu.inc@gmail.com>, Lewis Graham <lgraham@geocue.com>, Mike Umansky <mumansky@appliedimagery.com>, Paul Galla <paul.galla@leicaus.com>, Ramesh Sridharan <ramesh.sridharan@virtualgeomatics.com>

Hello Martin,

So the min/max/nodata values should be transformed values (Option 2 in my example), consistent with the XYZ min/max in the LAS header? Works for me.

How about the type for min/max/nodata? From what I can tell it will always be F64 unless the scale factor is invalid. Having the option for it to be "anytype" seems like an unnecessary complication of the standard from a programming perspective.

To answer your question about the "tuple" issue, I have only seen that implemented by the Topobathy LDP for the "sigma xyz" property. I personally would also revise that section of the specification to remove the "tuple" option entirely and simply instruct users to add a "[0] [1] [2]" tag to three otherwise identical definitions. Having the tuple option results in a

massive overcomplication programmatically.

Evon

[Quoted text hidden]

Martin Isenburg <martin.isenburg@gmail.com>

Tue, Jan 26, 2016 at 11:40 AM

To: Evon Silvia <esilvia@quantumspatial.com>

Cc: Michael Rosen <mrosen@lizardtech.com>, "sdharmapuri@mbakercorp.com" <sdharmapuri@mbakercorp.com>, Wanning Peng <wpeng@esri.com>, Arttu Soinen <arttu.soininen@kolumbus.fi>, Christian Sevcik <csevcik@riegl.com>, Christopher Parrish <Christopher.Parrish@oregonstate.edu>, David Reid <david.reid@optech.com>, Derek Morris <dmorris@geocue.com>, Gerhard Loeffler <Gerhard_Loeffler@trimble.com>, H Karl Heidemann <kheidemann@usgs.gov>, Howard Butler <hobu.inc@gmail.com>, Lewis Graham <lgraham@geocue.com>, Mike Umansky <mumansky@appliedimagery.com>, Paul Galla <paul.galla@leicaus.com>, Ramesh Sridharan <ramesh.sridharan@virtualgeomatics.com>

Hello,

Only min/max should be transformed. Not nodata. Nodata needs to be bit-identical to the data values as they needs to pass a comparison for exact identity. Yes, min/max should probably be designated as F64 and only nodata as anytype.

I agree with you about the complexity. In retrospect I wish I had not allowed the values to be pairs and tuples. Maybe we can deprecate them in a future revision.

Martin

[Quoted text hidden]

Evon Silvia <esilvia@quantumspatial.com>

Tue, Jan 26, 2016 at 2:07 PM

To: Martin Isenburg <martin.isenburg@gmail.com>

Cc: Michael Rosen <mrosen@lizardtech.com>, "sdharmapuri@mbakercorp.com" <sdharmapuri@mbakercorp.com>, Wanning Peng <wpeng@esri.com>, Arttu Soinen <arttu.soininen@kolumbus.fi>, Christian Sevcik <csevcik@riegl.com>, Christopher Parrish <Christopher.Parrish@oregonstate.edu>, David Reid <david.reid@optech.com>, Derek Morris <dmorris@geocue.com>, Gerhard Loeffler <Gerhard_Loeffler@trimble.com>, H Karl Heidemann <kheidemann@usgs.gov>, Howard Butler <hobu.inc@gmail.com>, Lewis Graham <lgraham@geocue.com>, Mike Umansky <mumansky@appliedimagery.com>, Paul Galla <paul.galla@leicaus.com>, Ramesh Sridharan <ramesh.sridharan@virtualgeomatics.com>

Martin,

I agree with you completely on all points, especially deprecation of pairs and tuples. I'll make a note on my copy of the 1.4 spec to propose it in the next revision cycle (assuming there will be one).

I'll give the other LWG members 24 hours to respond and then will consider this matter closed.

Evon

[Quoted text hidden]

Howard Butler <hobu.inc@gmail.com>

Tue, Jan 26, 2016 at 2:52 PM

To: Evon Silvia <esilvia@quantumspatial.com>

Cc: Martin Isenburg <martin.isenburg@gmail.com>, Michael Rosen <mrosen@lizardtech.com>, "sdharmapuri@mbakercorp.com" <sdharmapuri@mbakercorp.com>, Wanning Peng <wpeng@esri.com>, Arttu Soinen <arttu.soininen@kolumbus.fi>, Christian Sevcik <csevcik@riegl.com>, Christopher Parrish <Christopher.Parrish@oregonstate.edu>, David Reid <david.reid@optech.com>, Derek Morris <dmorris@geocue.com>, Gerhard Loeffler <Gerhard_Loeffler@trimble.com>, H Karl Heidemann <kheidemann@usgs.gov>, Lewis Graham <lgraham@geocue.com>, Mike Umansky <mumansky@appliedimagery.com>, Paul Galla <paul.galla@leicaus.com>, Ramesh Sridharan <ramesh.sridharan@virtualgeomatics.com>

+1 on all discussion points. The formalized ExtraBytes thing has given us a way out of having to roll new revisions on the specification for new data types, and it gives us good balance of known field types mixed with wild west data content.

I believe the tuples were added at my suggestion with the thinking that it might be helpful for an implementer to know the context of field groupings. In the end it is just extra work for everyone. We should work to deprecate or deemphasize

them in the next document if there is one. They're there now though, so we can't really fully take them back, but there's more than a few things in the spec that aren't widely adopted throughout all implementations.

[Quoted text hidden]

[Quoted text hidden]

Lewis Graham <lgraham@geocue.com>

Wed, Jan 27, 2016 at 4:14 AM

To: Howard Butler <hobu.inc@gmail.com>, Evon Silvia <esilvia@quantumspatial.com>, "Martin Isenburg (martin.isenburg@gmail.com)" <martin.isenburg@gmail.com>

Cc: Martin Isenburg <martin.isenburg@gmail.com>, Michael Rosen <mrosen@lizardtech.com>, "sdharmapuri@mbakercorp.com" <sdharmapuri@mbakercorp.com>, Wanning Peng <wpeng@esri.com>, Arttu Soininen <arttu.soininen@kolumbus.fi>, Christian Sevcik <csevcik@riegl.com>, Christopher Parrish <Christopher.Parrish@oregonstate.edu>, David Reid <david.reid@optech.com>, Derek Morris <dmorris@geocue.com>, Gerhard Loeffler <Gerhard_Loeffler@trimble.com>, H Karl Heidemann <kheidemann@usgs.gov>, Mike Umansky <mumansky@appliedimagery.com>, Paul Galla <paul.galla@leicaus.com>, Ramesh Sridharan <ramesh.sridharan@virtualgeomatics.com>

My interpretation of the specification is that the scale/offset value associated with Extra Bytes would apply to all fields with the exception, as Martin point out, of NaN.

Lewis Graham
GeoCue Group
9668 Madison Blvd., Suite 202
Madison, AL USA 35758
01-256-461-8289
www.geocue.com
www.LP360.com

LIDAR and Image Production Workflow Tools
Terrasolid sales and support
LP360 point cloud tools for ArcGIS
Small unmanned aerial systems hardware, processing software and services
Holder of FAA Section 333 sUAS exemption

[Quoted text hidden]