



G-PCC: Editors' FDIS questions

G-PCC Editors

1. Frame Index Attribute

Issue: more than one interpretation

Originally (m44813): Index values are relative

- External tool (ply-merge) splits frames
- Original frame offset lost, but sequence can be reconstructed from all frames

[0 1 2] [0 1] [0 1 2] -> 0 1 2 3 4 5 6 7

Later (m54699): Index values are absolute(?)

- Per-frame/slice attribute parameter signalling provides per frame offset

70+[0 1 2] 73+[0 1] 75+[0 1 2] -> 70 71 72 73 74 75 76 77

Question: which is it? or is it both (if offsets not present?)

2. Frame Index Attribute

Comments

Index values are not related to the frame counter

- However: they could be (*Amd1?*). Eg, if no absolute value signalled, derive from frame_ctr. NB: frame_ctr is not required to increment by 1 per frame.

Original scheme implied that all “sub-frames” happen before the next frame.

- Doesn't specify exactly when they occur.

Absolute scheme permits frames to overlap each other. Forbidden?

70+[0 1 5] 72+[0 1] 74+[0 2 3] -> 70 71 75 72 73 74 76 77

3. Attribute coding

Maximum number of components

Question: What is the maximum value of attribute_dimension_minus1?

- RAHT and LoD attribute coders support only $0 < \text{AttrDim} \leq 3$
- Raw attribute data unit supports $\text{AttrDim} > 0$

4. LoD attribute coding

Intra prediction

Intra prediction uses either average or direct prediction

- Direct prediction signals the index in a list of neighbours
- If the signalled index is out of bounds zero prediction is used

Question: Should conformance prohibit out of bounds indices?

- Aside: perhaps we should have incorporated the number of actual predictors into the mode decoding, rather than the maximum number

5. Scalable attribute coding

Division in quantization weight calculation

The weight derivation is:

```
for (lod = 0; lod < NumLods - 1; lod++) {  
    weight = !lod ? 1 : (geom_num_points_minus1 + 1) / LodSize[lod]  
    for (coeffIdx = 0; coeffIdx < LodCoeffCnt[lvl]; coeffIdx++)  
        CoeffWeight[LodCoeffIdx[lvl][coeffIdx]] = weight * 256  
}
```

Question: This is the only integer division operation, should it use the Div() approximation?

Question: Should the fractional bits be discarded?

- NB: the SW is: `double weight = numPoints / LodSize[lod]`

6. Scalable attribute coding

Extended inter search range equal to 0

In current SW:

- **Non-scalable case:** inter_lod_search_range=0 is a **full range** extended search
- **Scalable case:** inter_lod_search_range=0 **disables** the extended search

Question: Is this intended?

- Recommendation: align the definition
- NB: full range search may be specified with by a large range value.

7. Scalable attribute coding

Extended inter search centre (detail)

If **lod_scalability_enabled_flag** is equal to 0, and at least one neighbour has been found for the current point, the search centre is the position of the first neighbour:

```
for (centre = 0; centre < InLodSize - 1; centre++)  
    if (InLodIdxs[centre] == NeighIdxs[ptIdx][0])  
        break
```

Otherwise (**lod_scalability_enabled_flag** is equal to 1, or no neighbours have been found), the search centre is an index into InLodIdxs:

```
for (centre = 0; centre < InLodSize - 1; centre++)  
    if (Morton(AttrPos[PtIdx]) < Morton(AttrPos[InLodIdxs[centre]]))  
        break
```


7. Scalable attribute coding

Extended inter search centre

Search centre is index of:

- first found neighbour (unless scalable enabled), or
- nearest co-located point if no neighbours found

Question: Is it intended for the behaviour to change when scalable enabled?

- In previous SW versions, there was no distinction
- Introduction of new inter search was initially for non-scalable case only
- New inter search was added to scalable case, but code not reunified

8. Centroid based LoD subsampler for decimation

SW Question

The centroid based decimator picks one point from a group of $2 \times 2 \times 2$ blocks. Blocks are added to the group until the group contains at least N points.

The tmc13 encoder enforces the configuration " $N \leq 8$ "

Question: Is this check correct? Should it be a spec limit?

- NB: A group may contain up to $N + 7$ points
- If the group contains 8 or more points, the last point is selected (w/o centroid)

9. Centroid based LoD subsampler for decimation

Consistency

Subsampling rate (N) is configured In current SW:

- Centroid: $\text{lodIndex} + \text{lod_dist2}$
- Distance: $\text{lodIndex} + \text{lod_dist2} + \text{lod_dist2_offset}$

Question: Why is `lod_dist2_offset` omitted for centroid case?

- NB: in centroid case, `lod_dist2_offset` may be signalled in slice header

10. HLS: clarifying unique_points_flag

Confusing HLS

The unique_points_flag is similarly named to the unique_points_constraint_flag.

- unique_points_constraint_flag indicates that there are no duplicate points
- unique_points_flag indicates that the duplicate point count is **not** signalled

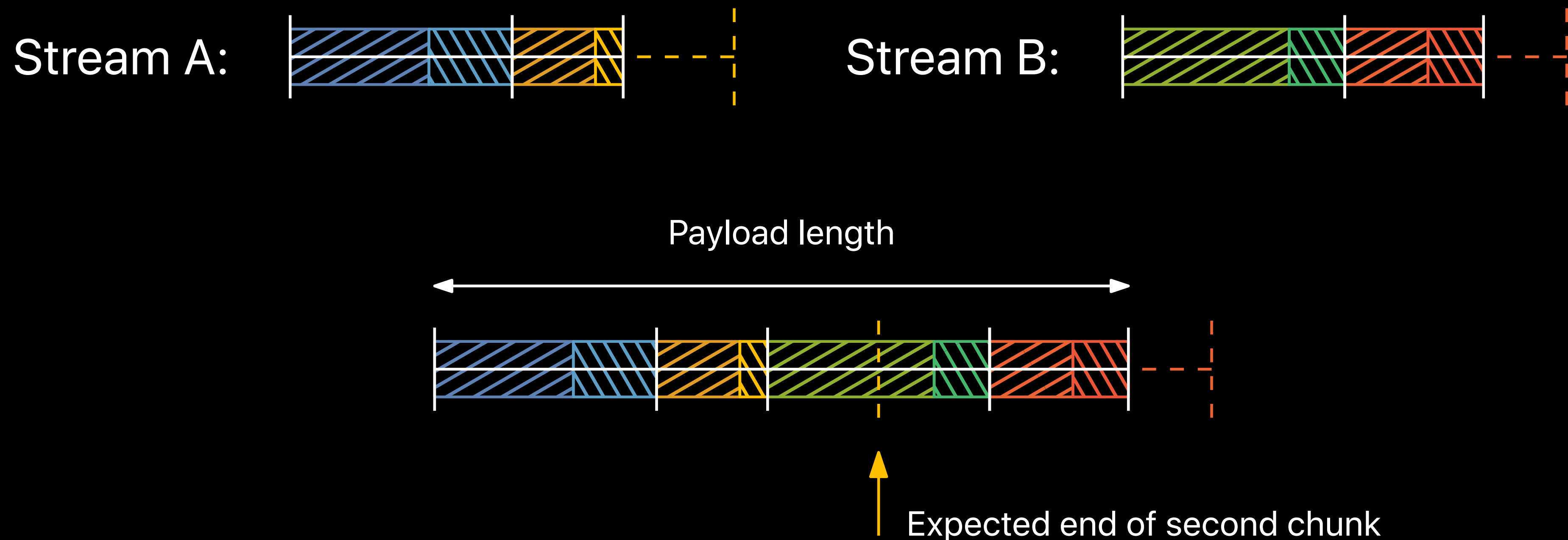
Normally we assert when something is present, rather than assert that it isn't.

- Suggestion: Rename **unique_points_flag** to **duplicate_points_enabled_flag**
- NB: this **inverts** the sense of the flag and avoids "if(**!**unique_points_flag)"

11. Octree stream offsets

Issue: Adoption requires fix

Adoption of octree sub-stream offset removal (m55576) results in signalling issue with chunked entropy streams



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Adoption of octree sub-stream offset removal (m55576) results in signalling issue with chunked entropy streams

- NB: this wasn't an issue prior to the reversal of the bypass sub-stream order

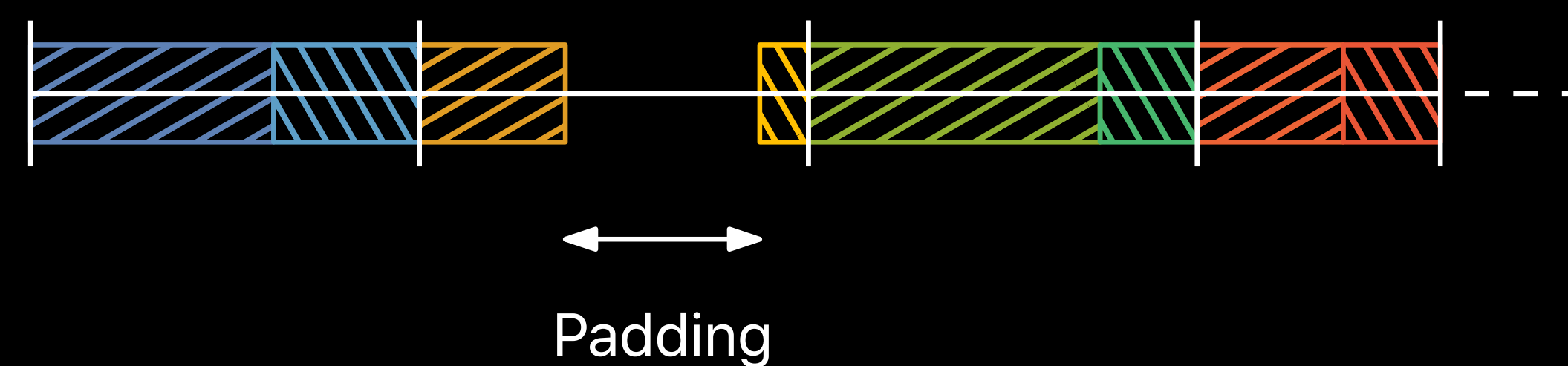
Possible fixes (from most to least efficient):

- A. Fix concatenation (by adjusting a chunk)
- B. Restoring the offsets
- C. Fix concatenation (by adding padding)

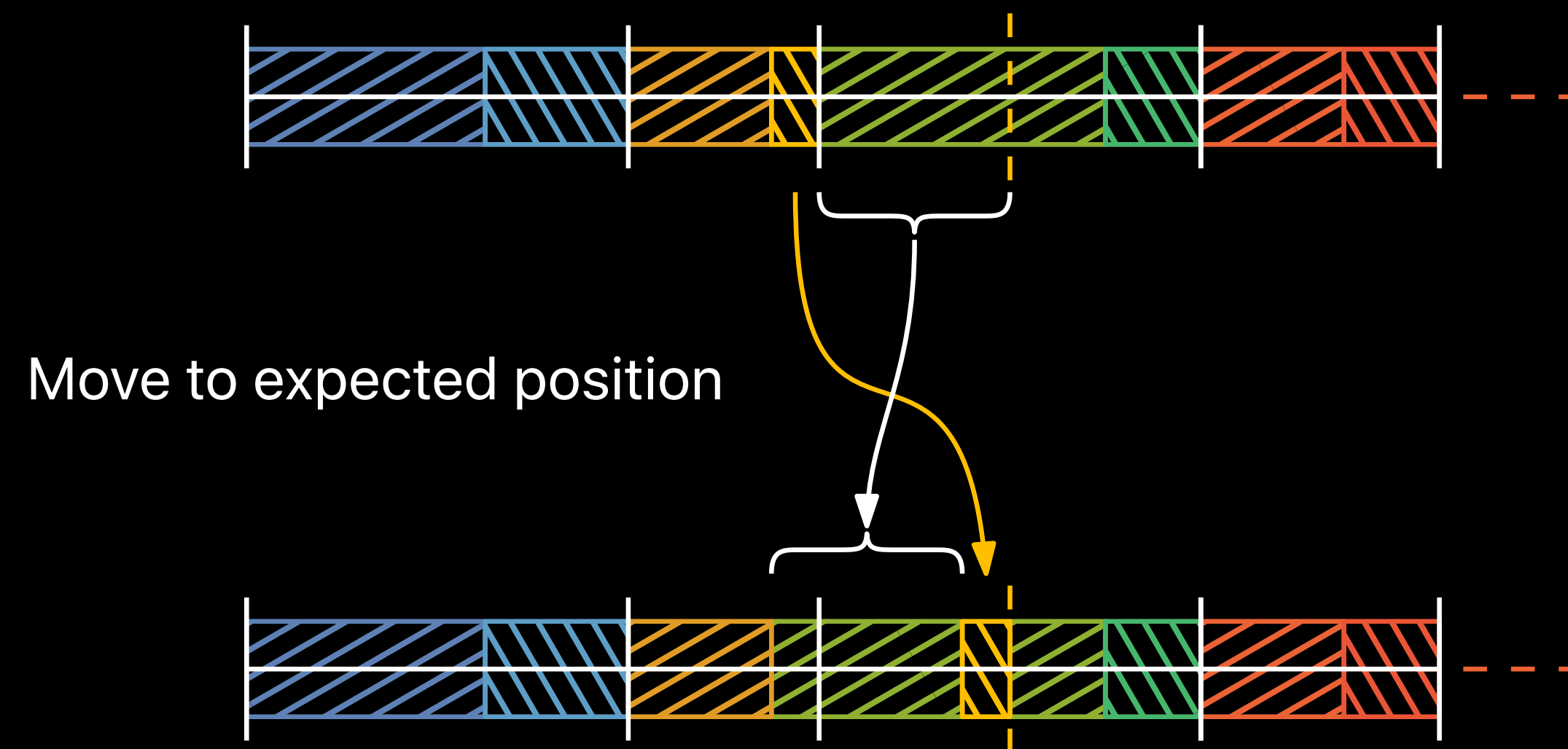
11. Octree stream offsets

Issue: Adoption requires fix

Fix concatenation (by adjusting a chunk)



Fix concatenation (by adding padding)



12. In-tree geometry quantisation depth signalling

Forgotten adoptions

Software release notes (v9.0-rc1)

m52521: Signalling quantisation depth on a per-level basis.

This adoption fundamentally conflicts with another higher-priority adoption (m52400 planar mode interaction fix) made at the same time.

This topic should be re-reviewed at the next meeting.

Was not re-reviewed. However, the adoption of m53677 removed the conflict.

Question: Should we do anything?

13. Sign bit values

Consistency

- Sign flag indicates if a signed value is positive or negative
- Some uses are inconsistent (se(v) vs. flags)
 - Original intention was $\text{sign} = 1$ to indicate negative value: $(1 - 2 \times \text{sign}) \times \text{value}$
- Sign bit should occur at end of value, not immediately after foo_abs_gt0_flag
 - Simplifies description of syntax element binarisation

