

Paper for Consideration by TSMAD 25
Proposed S-58 Validation Check on the Vertex Density of Edges

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Executive Summary:	This paper discusses the encoding density of edge primitives.
Related Documents:	S-58
Related Projects:	Next version of S-58

Proposed S-58 Validation Check on the Vertex Density of Edges

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The proposed check

Edge primitives should not be encoded at a vertex density greater than 0.3 mm at compilation scale.

Note: The term, *compilation scale*, refers to S-57. For S-101 you would use the term, *maximum display scale*.

Origin of the proposed check

ENC Product Specification 3.8: *Linear features must not be encoded at a point density greater than 0.3 mm at compilation scale.*

Clarification 1.Cl.33 states ENC Product Specification clause 3.8 should be treated as a recommendation rather than a rule.

Rationale for the proposed check

1. Efficiency of the data. An ENC with an unusually high vertex density can perform slower within an ECDIS display (loading, panning, zooming and general processing of the data).
2. A smaller vertex density leads to a reduction in data volume.
3. There is a limit on the number of SG2D fields allowed for an edge due to restrictions on the DDR length.

Implications and considerations

1. There is a concern that the introduction of this test will lead to *validation noise*, i.e. a vast number of low severity validation warnings might cause the validator to miss really important errors.

Response:

- a. There are investigations within S-58 to incorporate more levels of severity that can be attributed to checks. This is an instance of a low severity warning which, whilst potentially affecting performance, will not impact the safety of the ENC.

- b. The validation tool might group such warnings into a category such as *redundant encoding*. The validation operator could turn off or hide this category and concentrate on the more serious errors.
 - c. Most production and post production systems contain optimising or filtering functionalities that are able to *thin* data for the intended viewing scale, e.g. a high resolution contour within a hydrographic database would be *thinned* to each product scale band appropriately. If the production system filters the contour to a 0.3 mm vertex density, for example, and the validation tool has its tolerance set to 0.25 mm, then there should be no warnings.
2. It has been proposed that only a single warning be reported for the entire cell when a significant number of vertices (e.g. 10% of the total number of vertices encoded) are affected. The warning would suggest that a filtering algorithm be run. The rationale is that if there are only a few vertices where the density exceeds the suggested tolerance, then it probably isn't worth raising a warning.

Response:

It is difficult to choose what would constitute a small number of vertices. 10% is an arbitrary figure, and if the 10% of offending vertices are evenly scattered throughout the cell, then there is unlikely to be a problem. If these 10% are clustered in one location, then this is where filtering would be of benefit. It is also useful to provide the locations of the vertices, as the encoder may sometimes wish to apply the fix manually.

Summary recommendations

1. Add the proposed check to S-58.
2. Assign the lowest priority warning to the check.
3. Data producers apply filtering to the ENC end product.
4. Validation tools to make it easy for users to filter out / disregard low priority warnings, if they so choose.