Variable Resolution Surfaces

TELEDYNE CARIS
Everywhereyoulook™

Improving Elevation Models to Better Map the Ocean Floor

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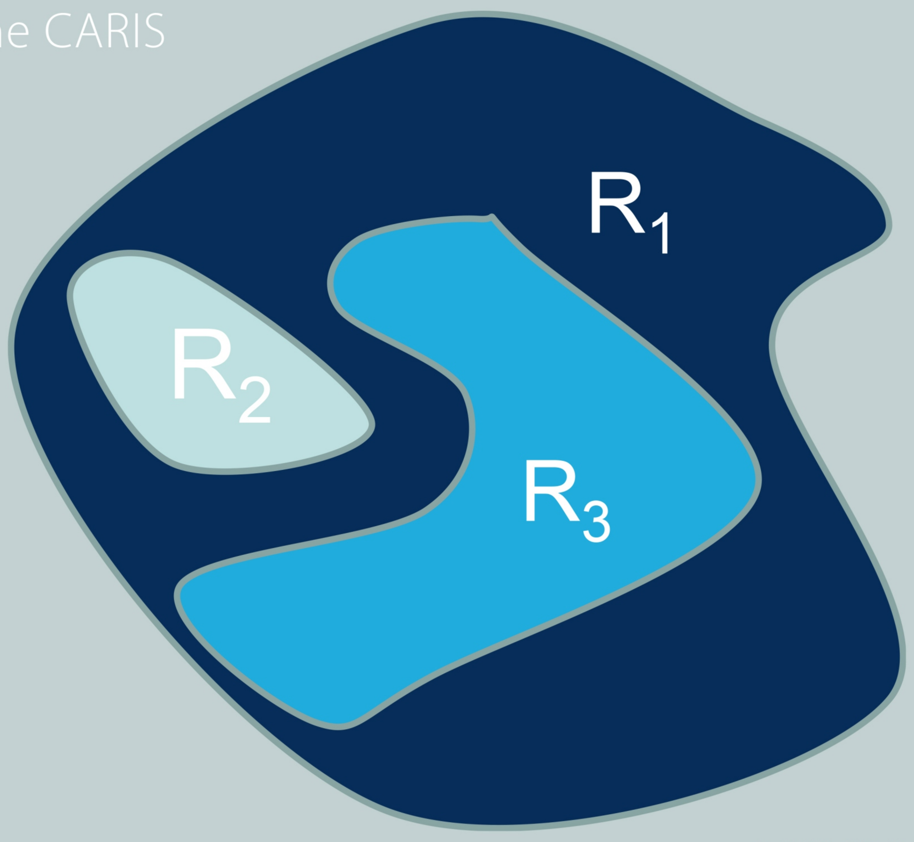


WHAT

A Variable Resolution Surface is a digital elevation model (DEM) where the resolution varies over different areas of the model, to better reflect the properties of the source data.

WHY

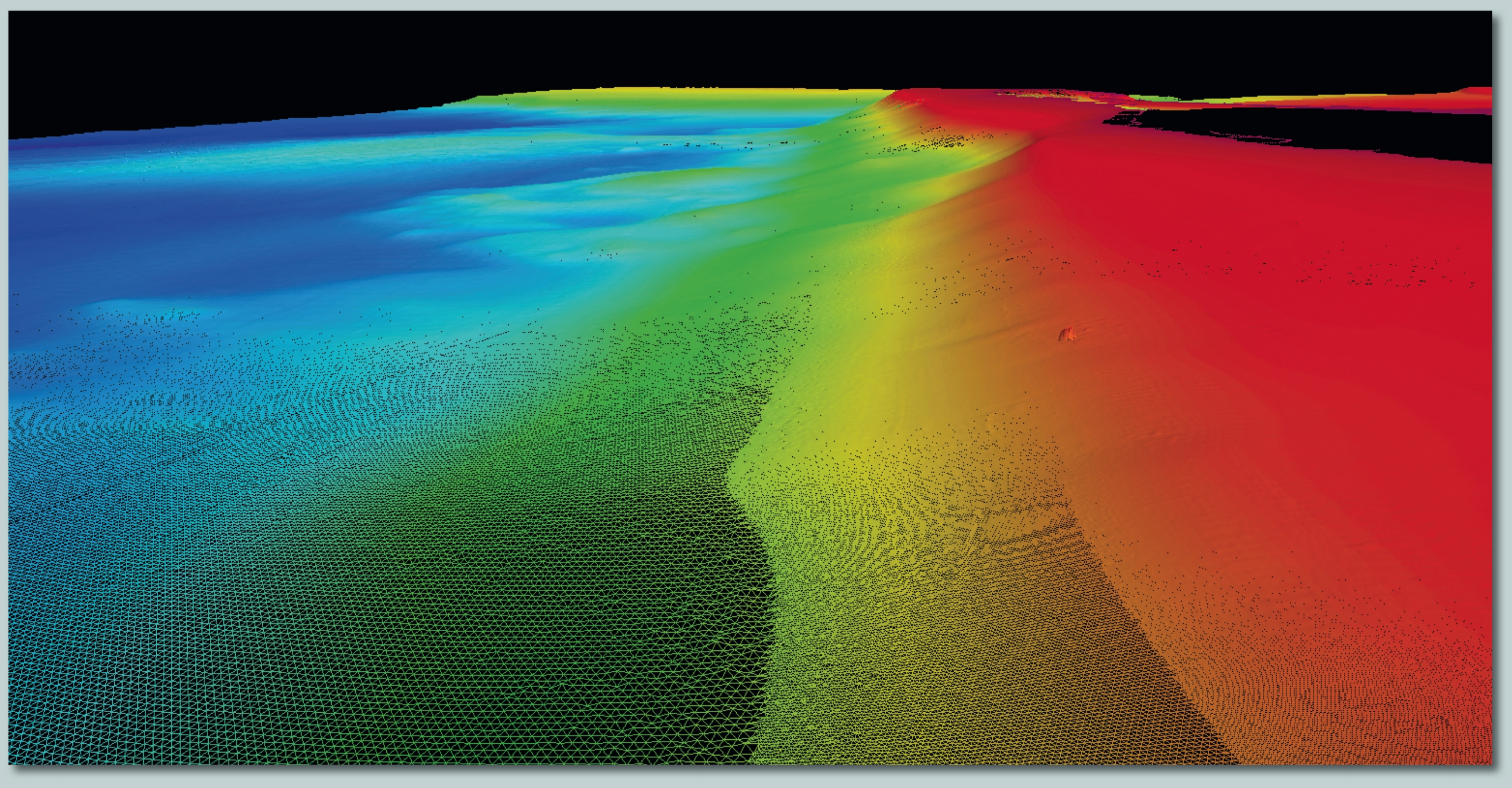
Hydrographic survey data usually has different densities in different areas.

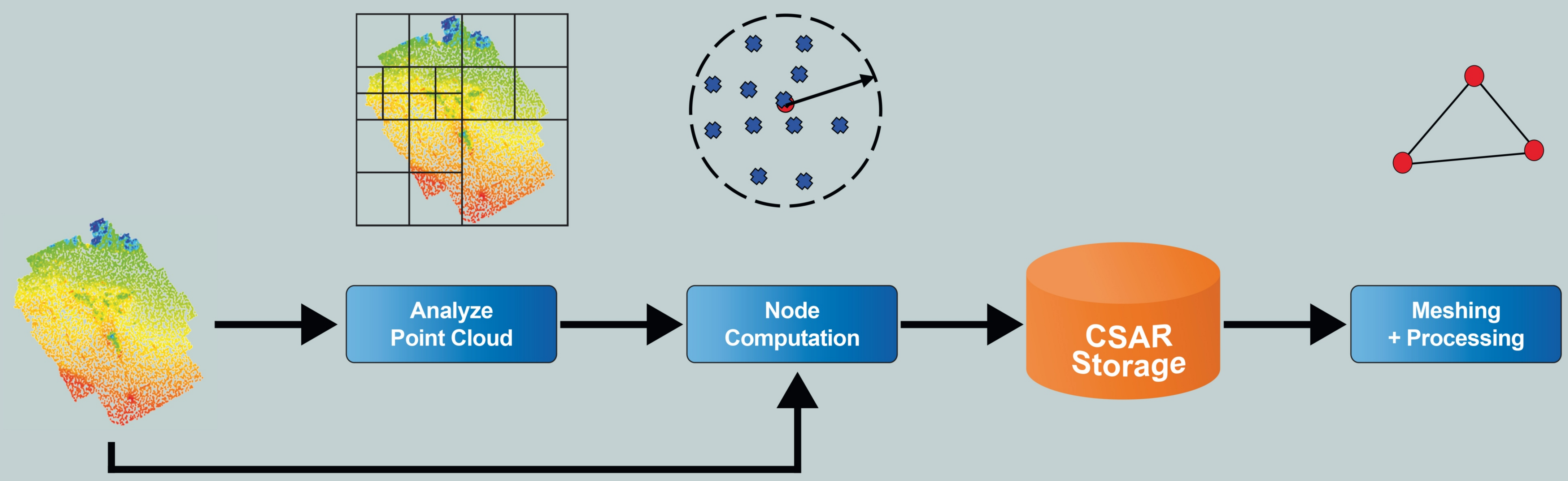
Traditionally the data has been modelled in surfaces with a single resolution. This can lead to surfaces with a too coarse or too fine resolution, or to the necessity to split up survey data over different models.

Within the hydrographic community there is therefore a clear requirement to find a way to better model the survey data.

Using state of the art processing and visualization techniques Teledyne CARIS has now developed the ability to create Variable Resolution Surfaces.

These surfaces will allow the creation of better models of the ocean floor and will lead to workflow efficiencies and easier data management.





HOW

The first step in the creation of a Variable Resolution Surface is to analyze the source data. This is a point cloud of elevation data, for example multi-beam echosounder data.

A quad tree algorithm will split up the point cloud area in different **TILES** to create a resolution map. The higher the data density in an area, the smaller the tiles will become.

The second step is to compute the node resolution of the individual tiles. This can be computed either by depth range or by data density.

After that the elevation values of individual nodes are being computed based on the source data, using hydrographic algorithms, like CUBE.

The variable resolution surface is stored in a CARIS CSAR file.

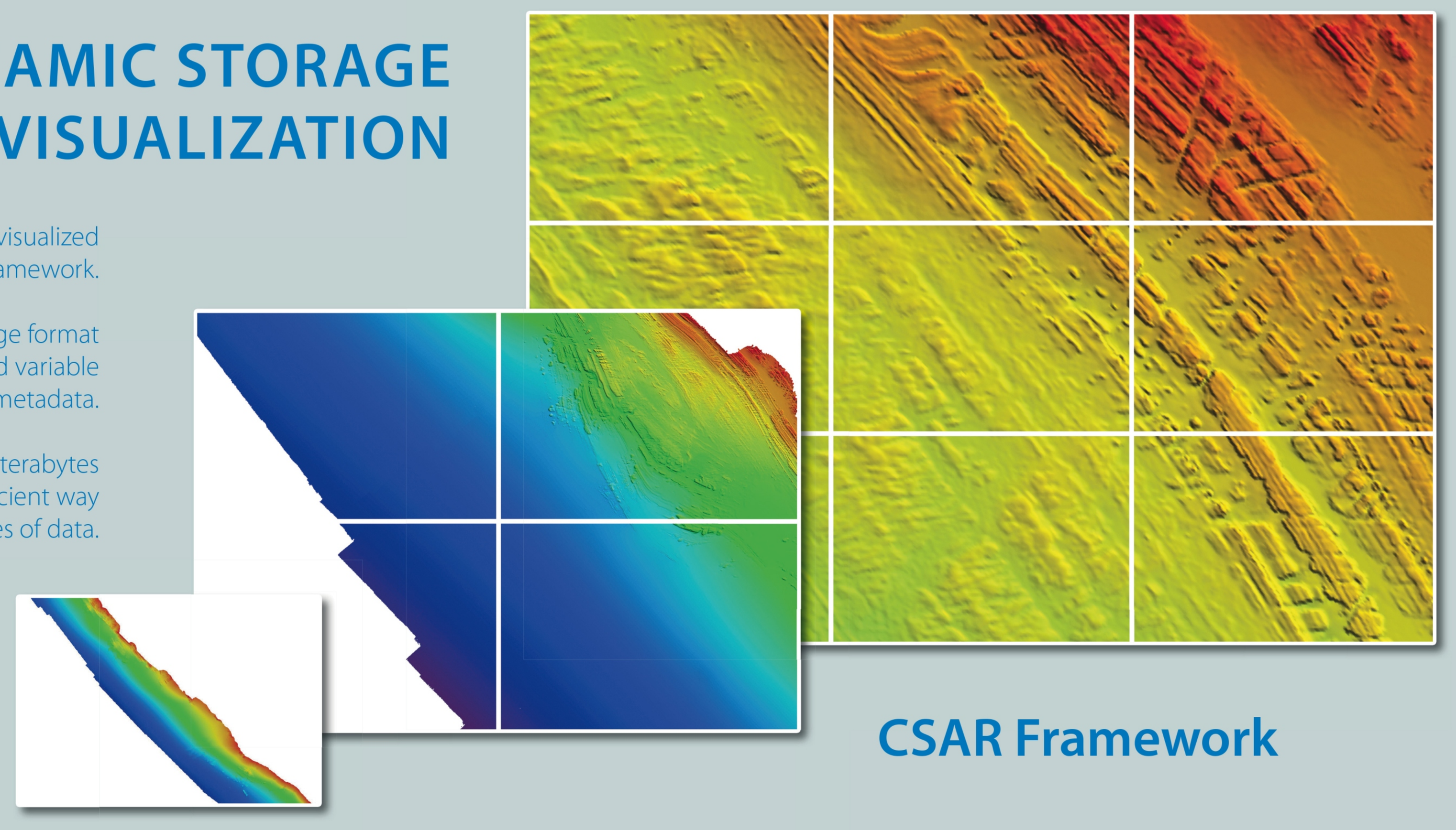
The creation of a mesh between the nodes on the different tiles is done on the fly during visualization.

DYNAMIC STORAGE & VISUALIZATION

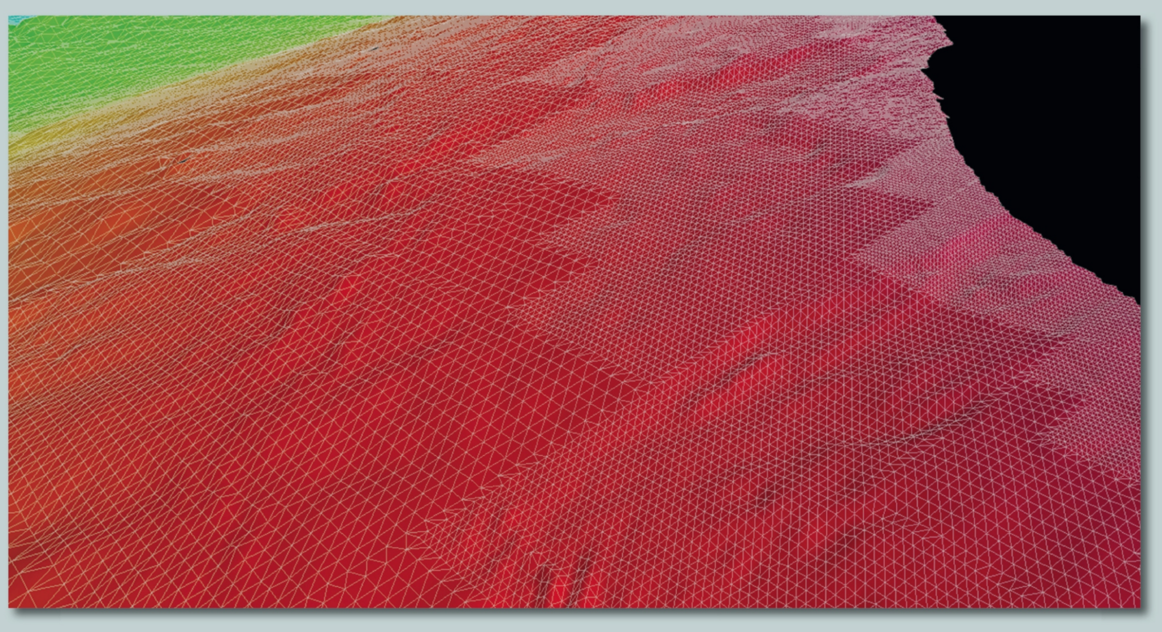
Variable Resolution Surfaces are stored and visualized using the CARIS Spatial Archive (CSAR™) Framework.

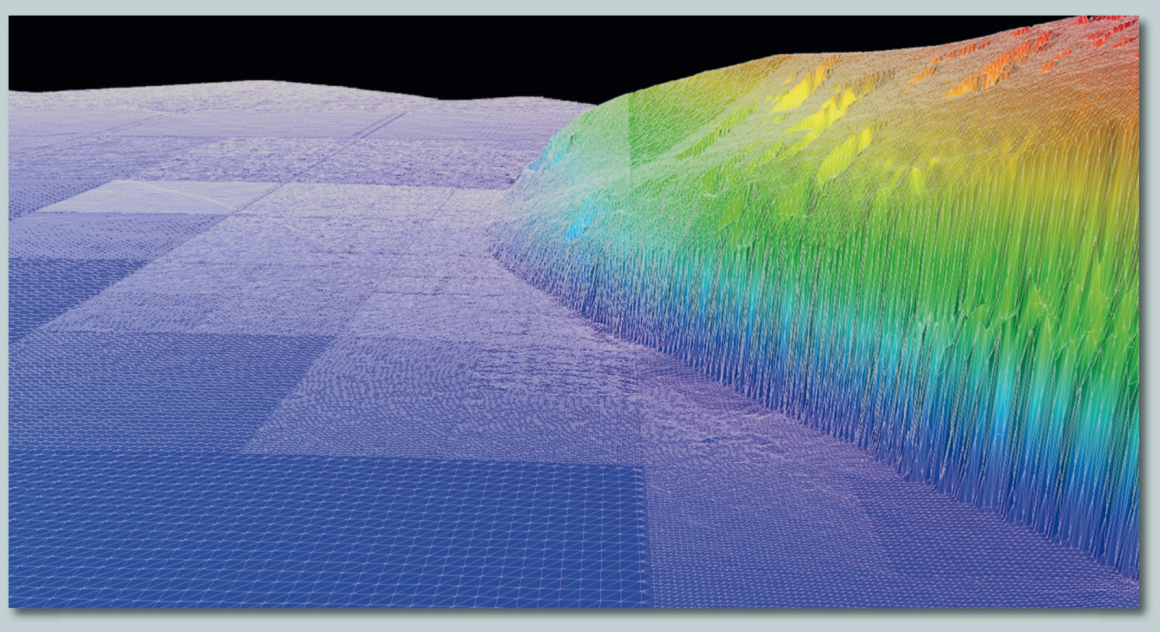
CSAR acts as a single file storage format for gridded, point cloud, and variable resolution data, as well as metadata.

It is scalable to billions of grid nodes and terabytes of data. Therefore this format is a very efficient way of storing and visualizing huge volumes of data.



CSAR Framework





TILE RESOLUTION BASED ON DEPTH RANGE

After an initial division of the Variable Resolution Surface in individual tiles, the final resolution of these tiles is set by a predefined value per depth range.

TILE RESOLUTION BASED ON SOURCE DATA DENSITY

With this technique the resolution of the nodes depends on the number of data points (soundings) within a tile. If there are more points, the resolution is higher.

Instead of the user forcing the tile resolution a priori, the model can be created utilizing the best point spacing possible. This will reflect the dataset in the most optimal way.