CARIS Variable Resolution Surfaces

Presentation for the 14th Conference of the IHO Hydrographic Commission on Antarctica

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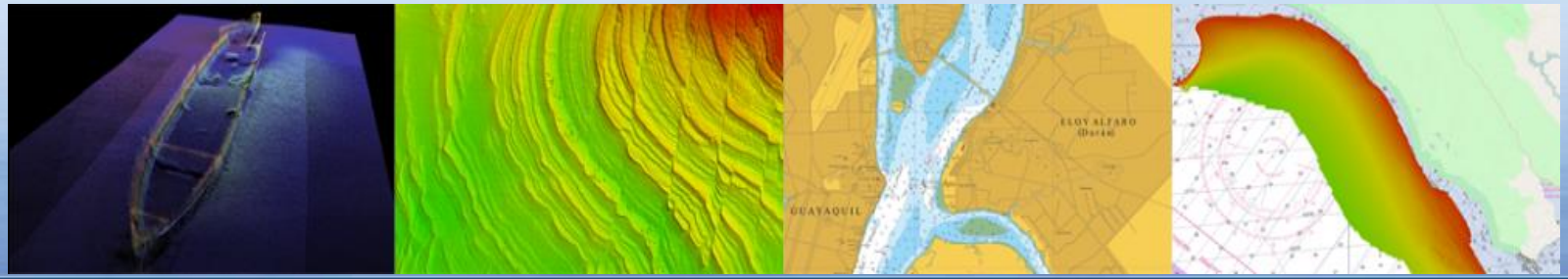
Tromsø, Norway - 29-06-2016

CARIS' Ping-to-Chart Solution

Teledyne CARIS offers the maritime community a complete and streamlined GIS solution from Ping-to-Chart.

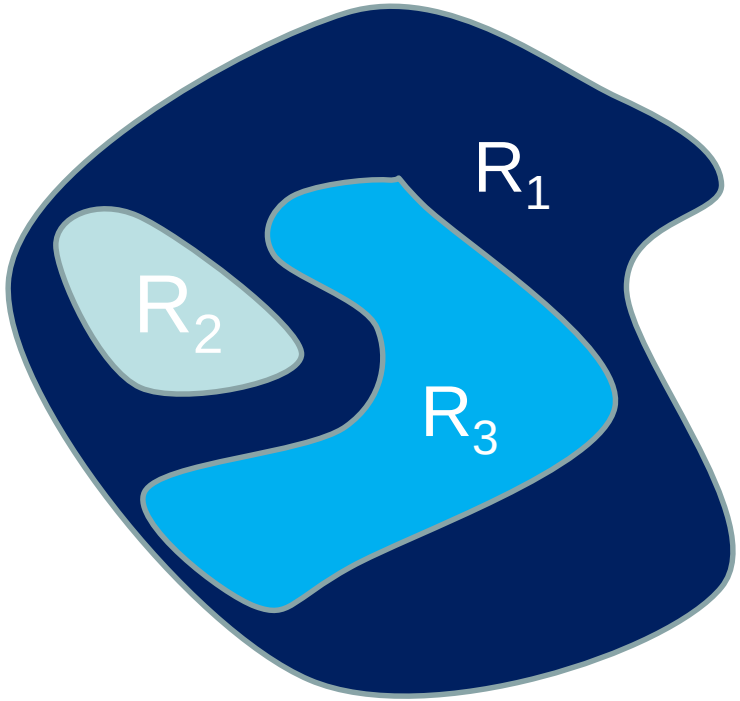
- Data processing through to chart production and subsequent distribution of the marine information and chart products
- Seamless data transfer and interoperability for increased efficiencies
- Development based on requirements in hydrographic community

Processing **Analysis** **Production** **Discovery**



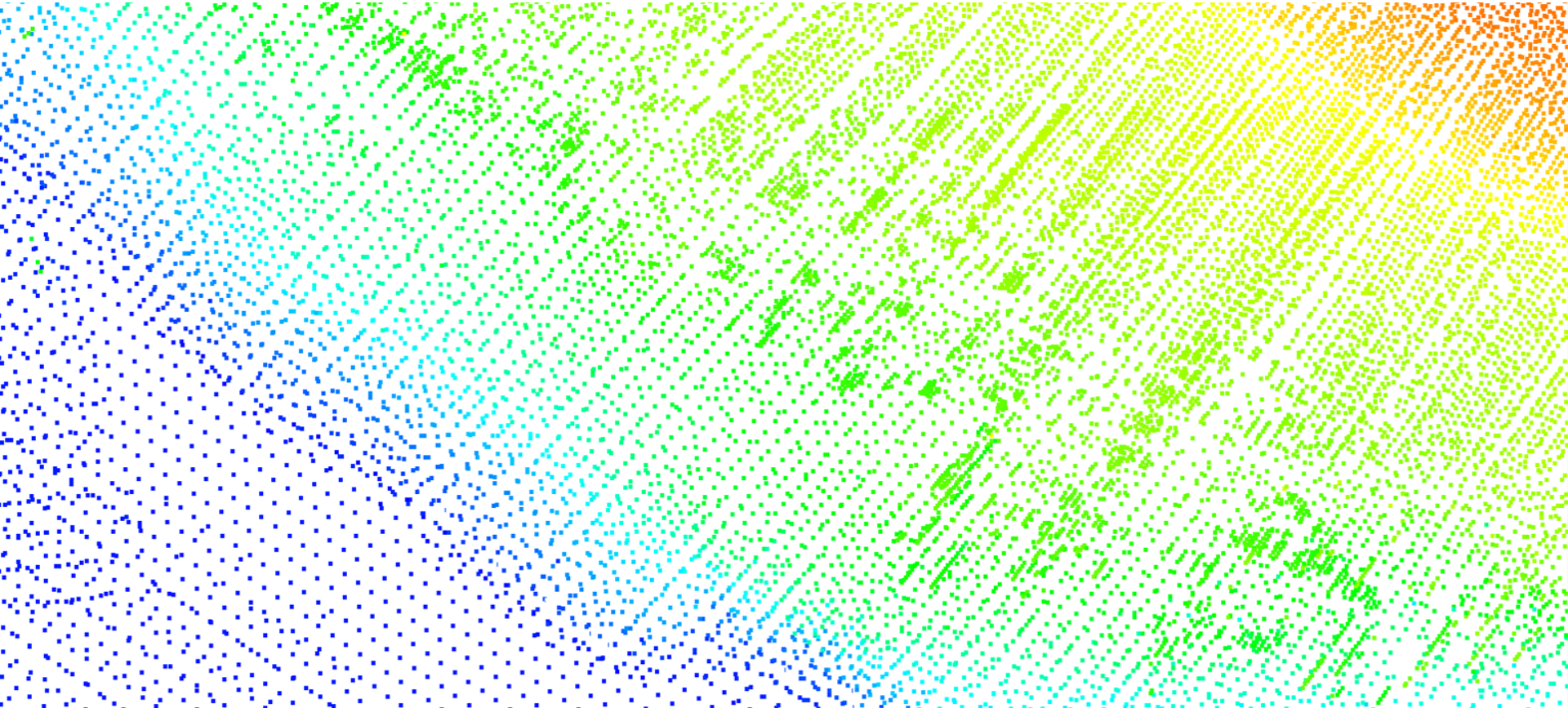
Variable Resolution Surface

Digital elevation model where the resolution varies over different areas of the model

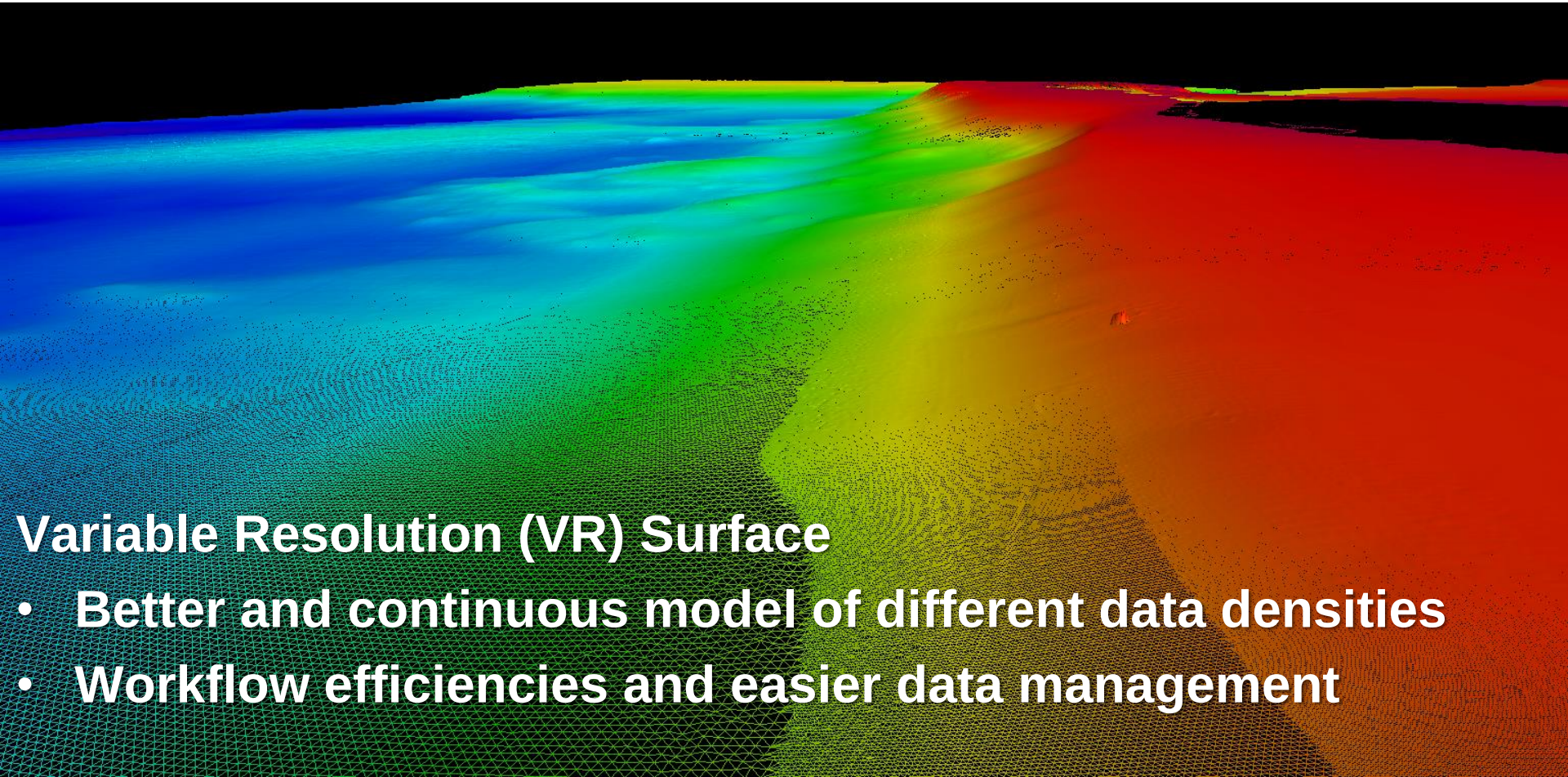


Motivation – The challenge

- Remote sensing data is not regularly spaced - difficult to model



Motivation – The solution



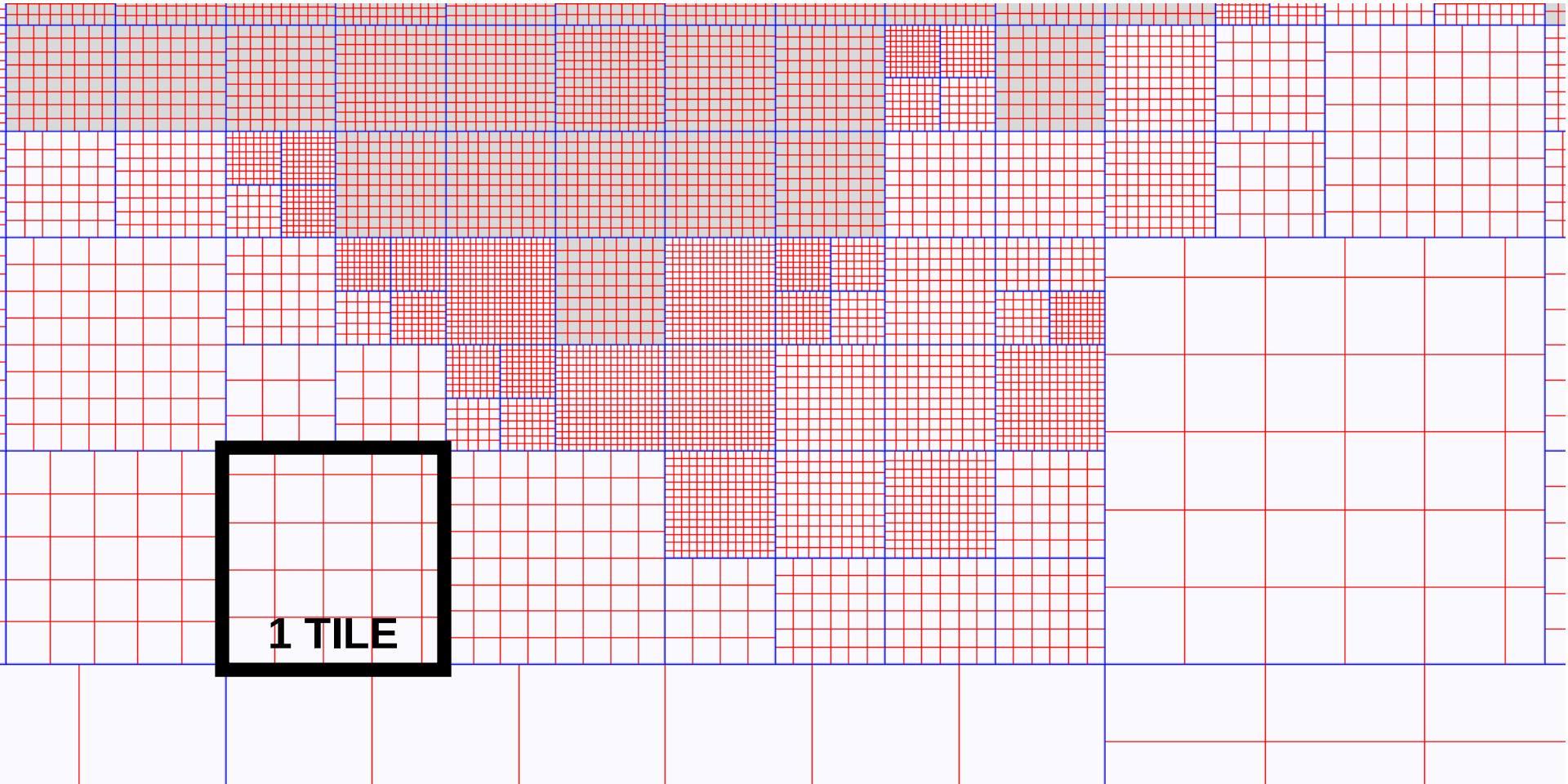
Variable Resolution (VR) Surface

- **Better and continuous model of different data densities**
- **Workflow efficiencies and easier data management**

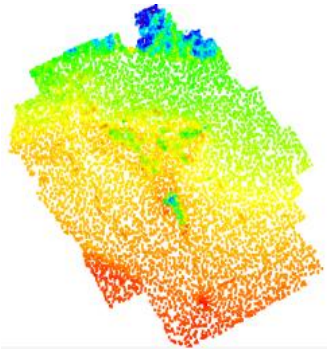
What is a Variable Resolution Surface?

- Defines every value within a continuous area
- Surface values are explicitly defined at nodes
- Variable Resolution (VR) surface has regularly spaced nodes within a **tile** with resolution defining spacing between nodes for that tile
- A mesh defines values everywhere else

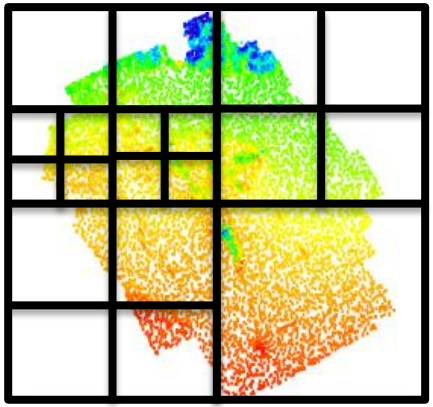
VR Surface - Tiles



VR Surface - Creation



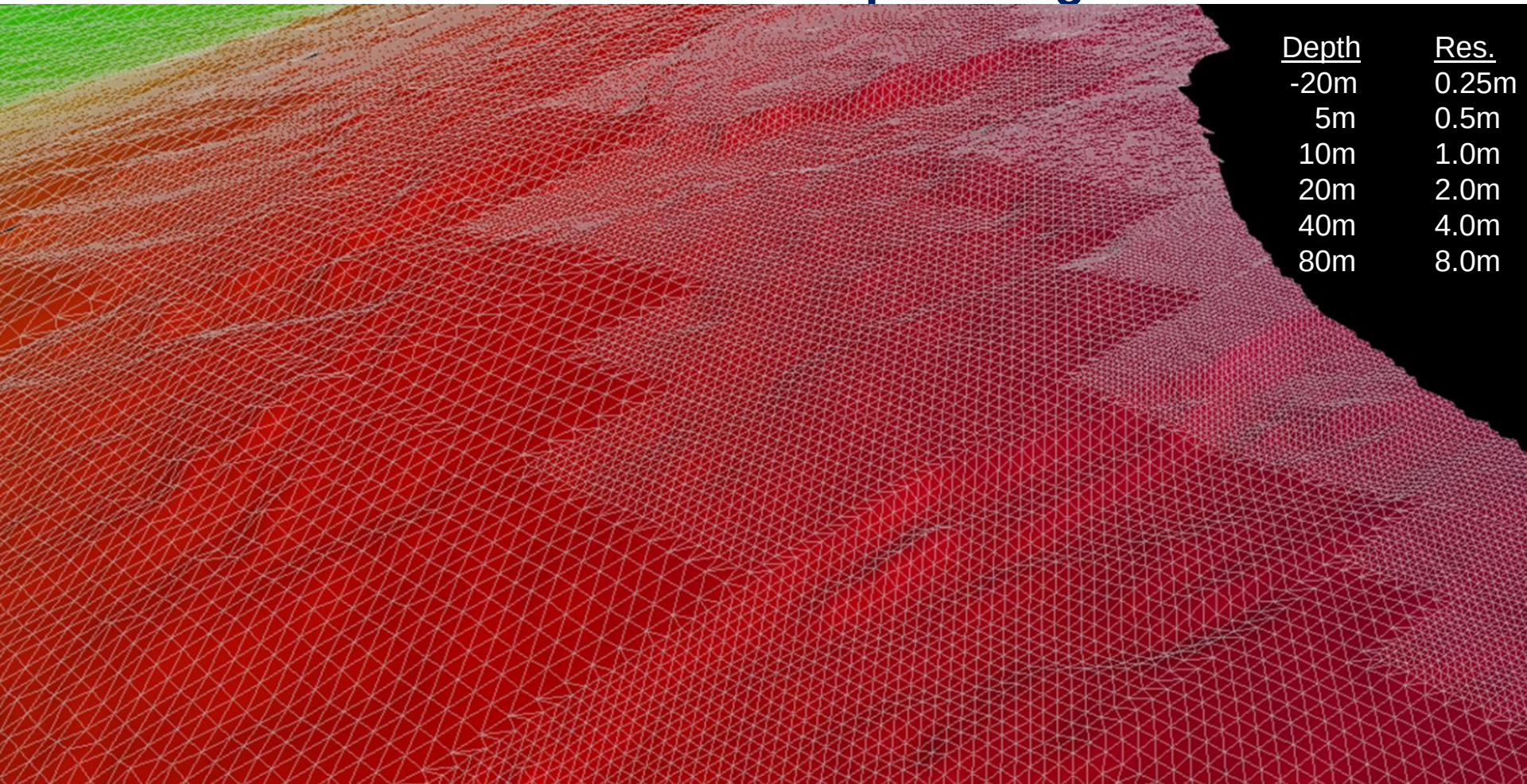
Analyze Point Cloud



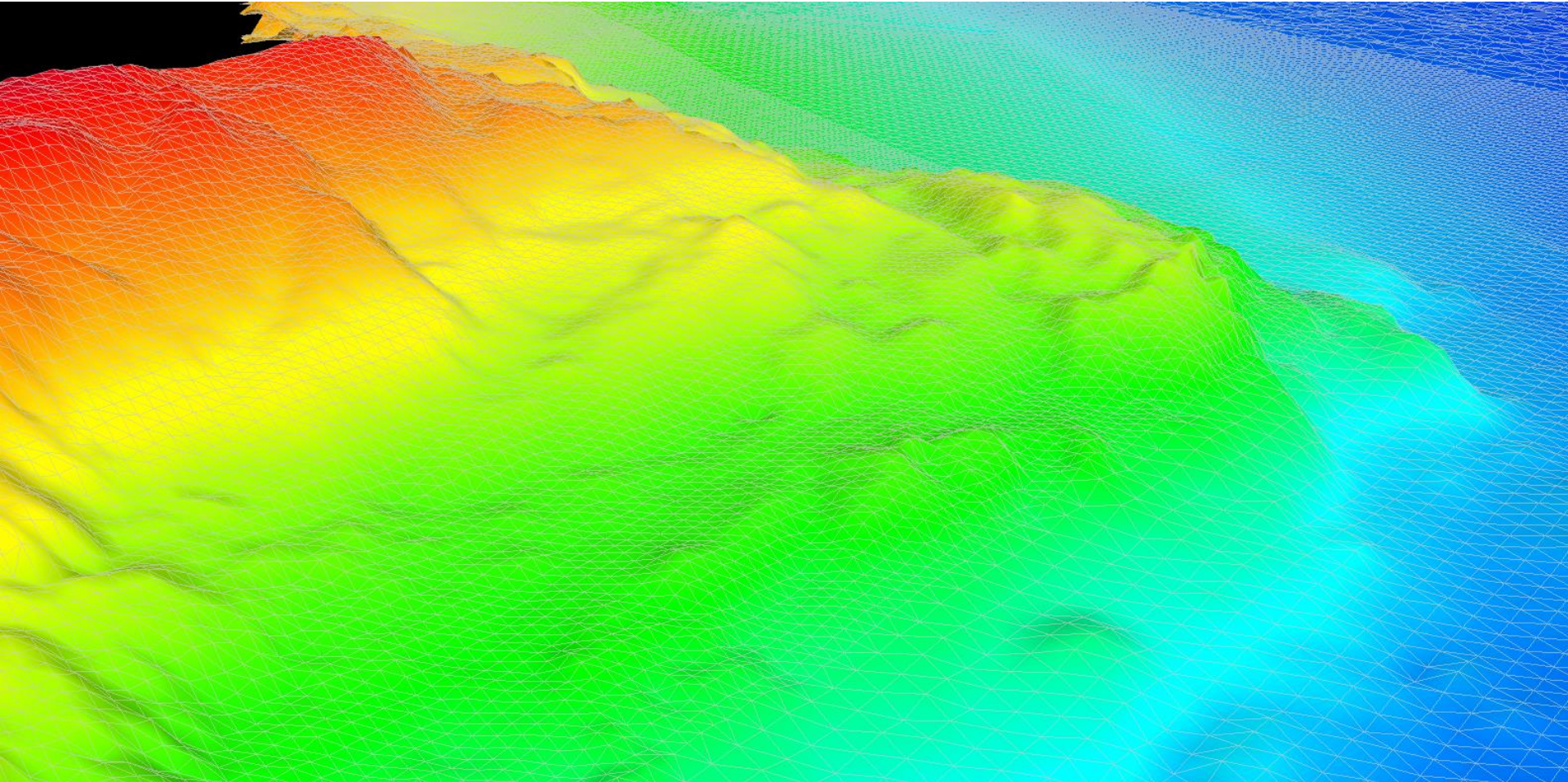
Resolution Map

- Step 1: Compute All Tiles
  - Based on Point Cloud
  - Result: Resolution Map
  - Tiles have roughly an equal number of points
- Step 2: Compute Individual Tile Resolution
  - By point density or depth range

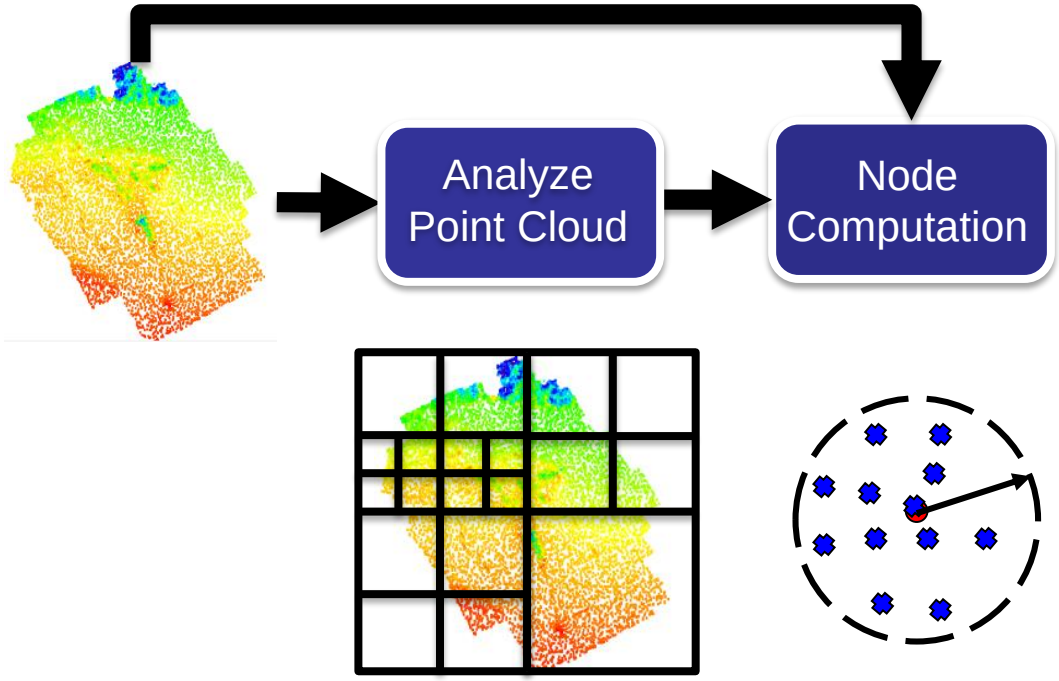
VR Surface - Resolution from Depth Range



VR Surface - Resolution from Density

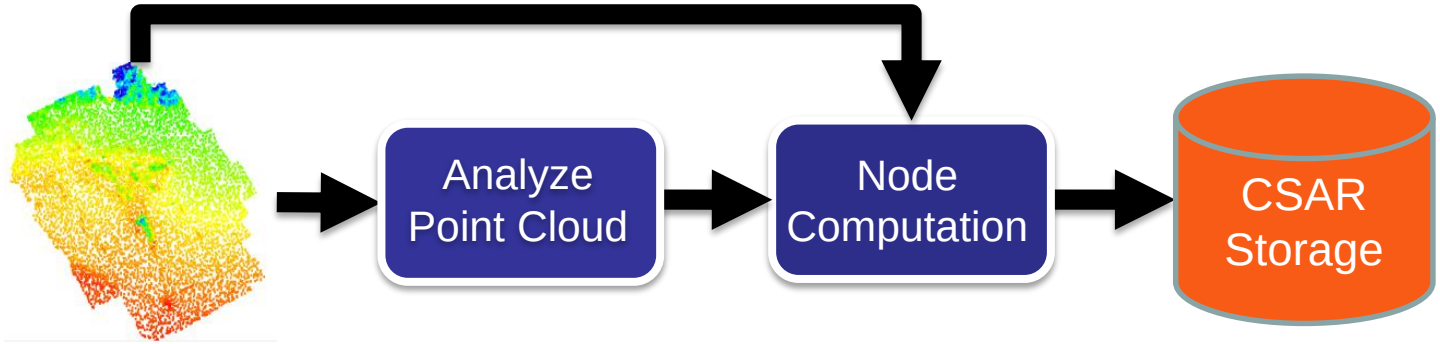


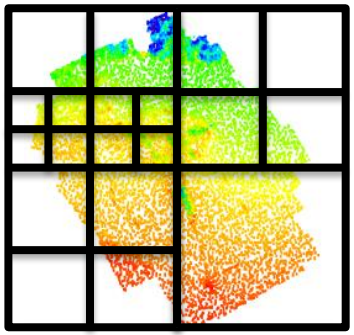
VR – Node Computation

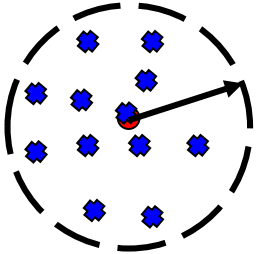


- Step 3: Node Computation
  - Simple statistic
  - Inverse Distance Weighting
  - Swath Angle
  - CUBE

VR - Storage

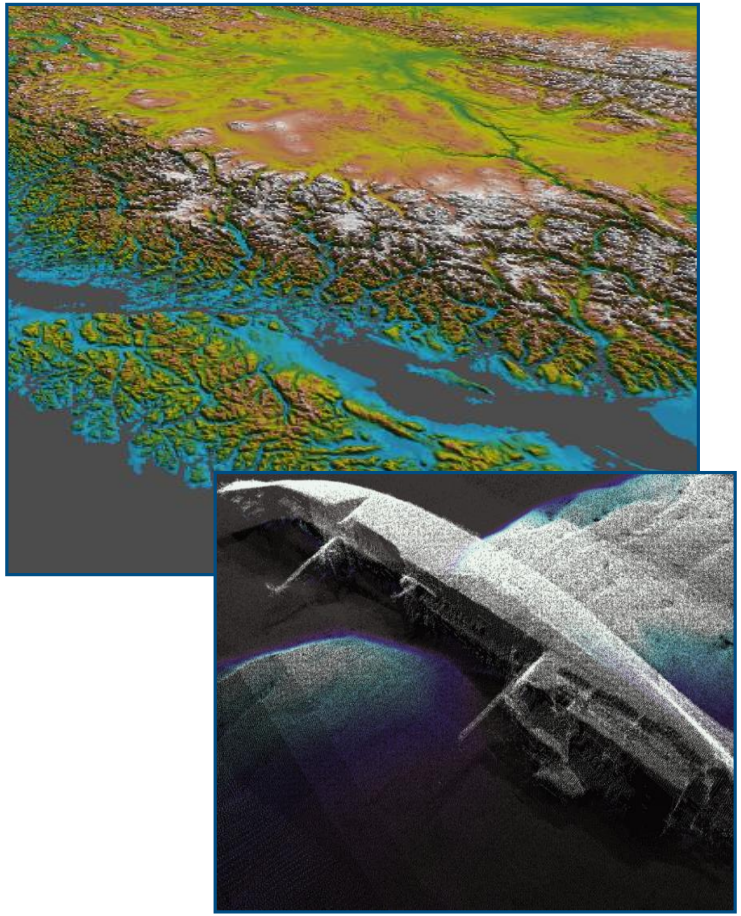






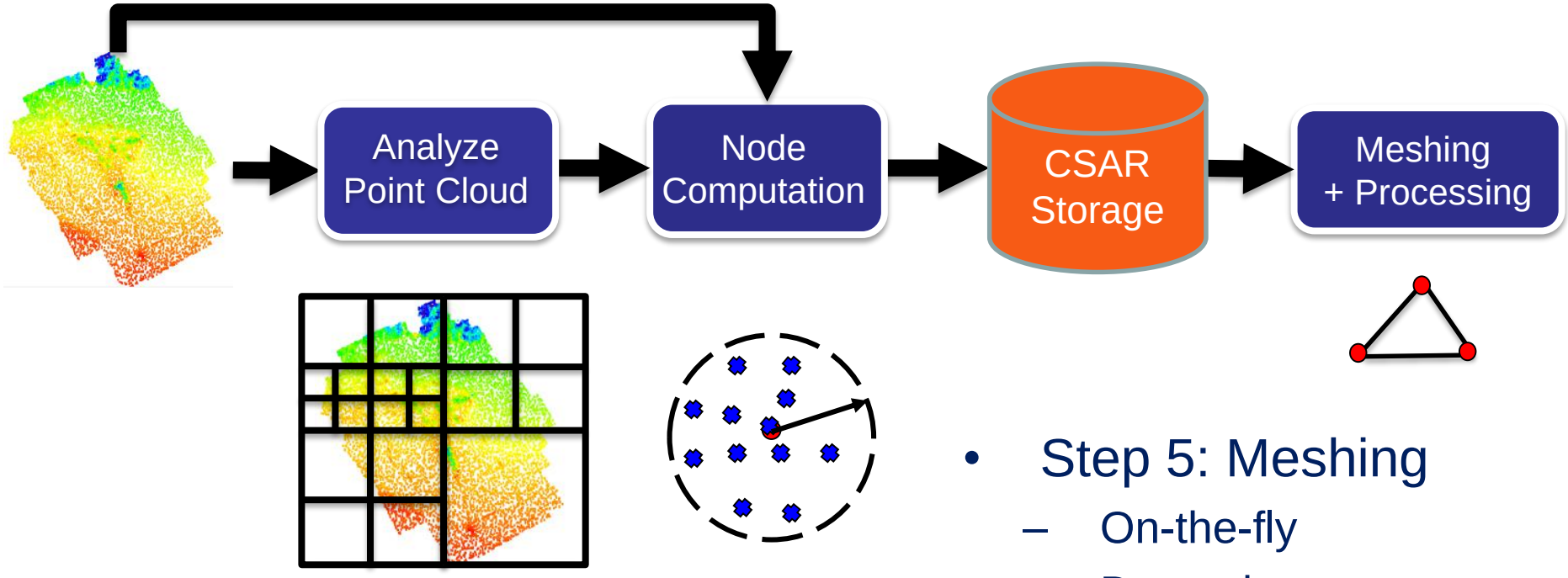
- Step 4: Storage

VR Storage: CSAR Framework



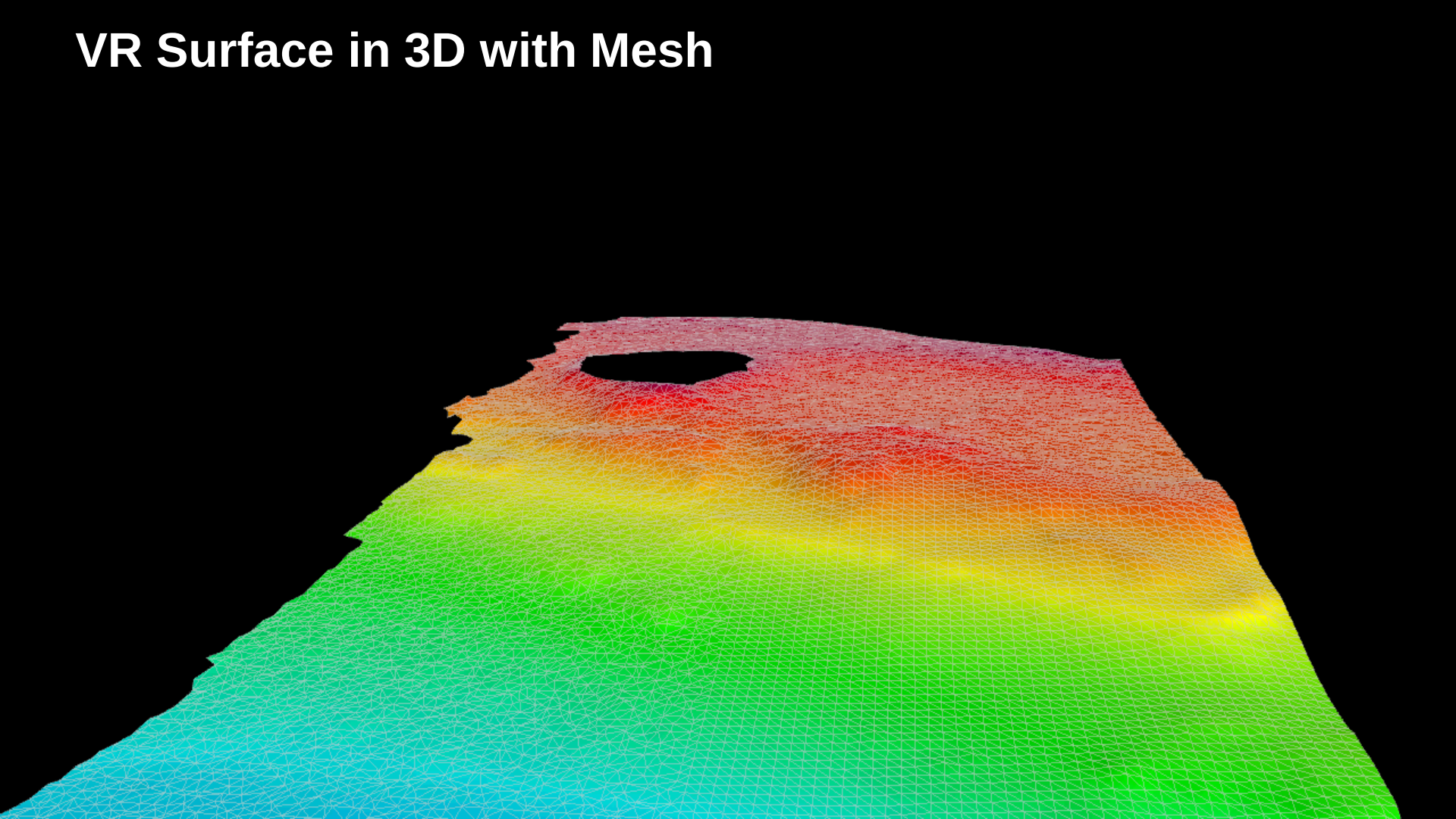
- **C**ARIS **S**patial **AR**chive (**CSAR**)
- Single file storage format for gridded, point cloud and variable resolution data (+ metadata)
- Scalable to billions of grid nodes, terabytes of data
- Level of detail pyramid

VR – Dynamic Mesh



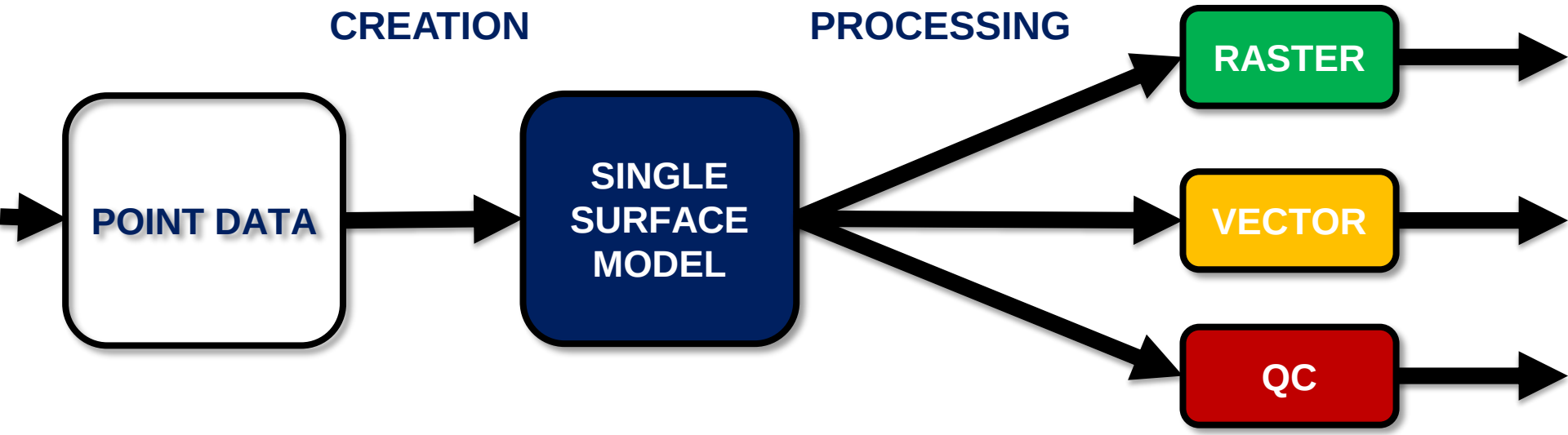
- Step 5: Meshing
  - On-the-fly
  - Dynamic

VR Surface in 3D with Mesh

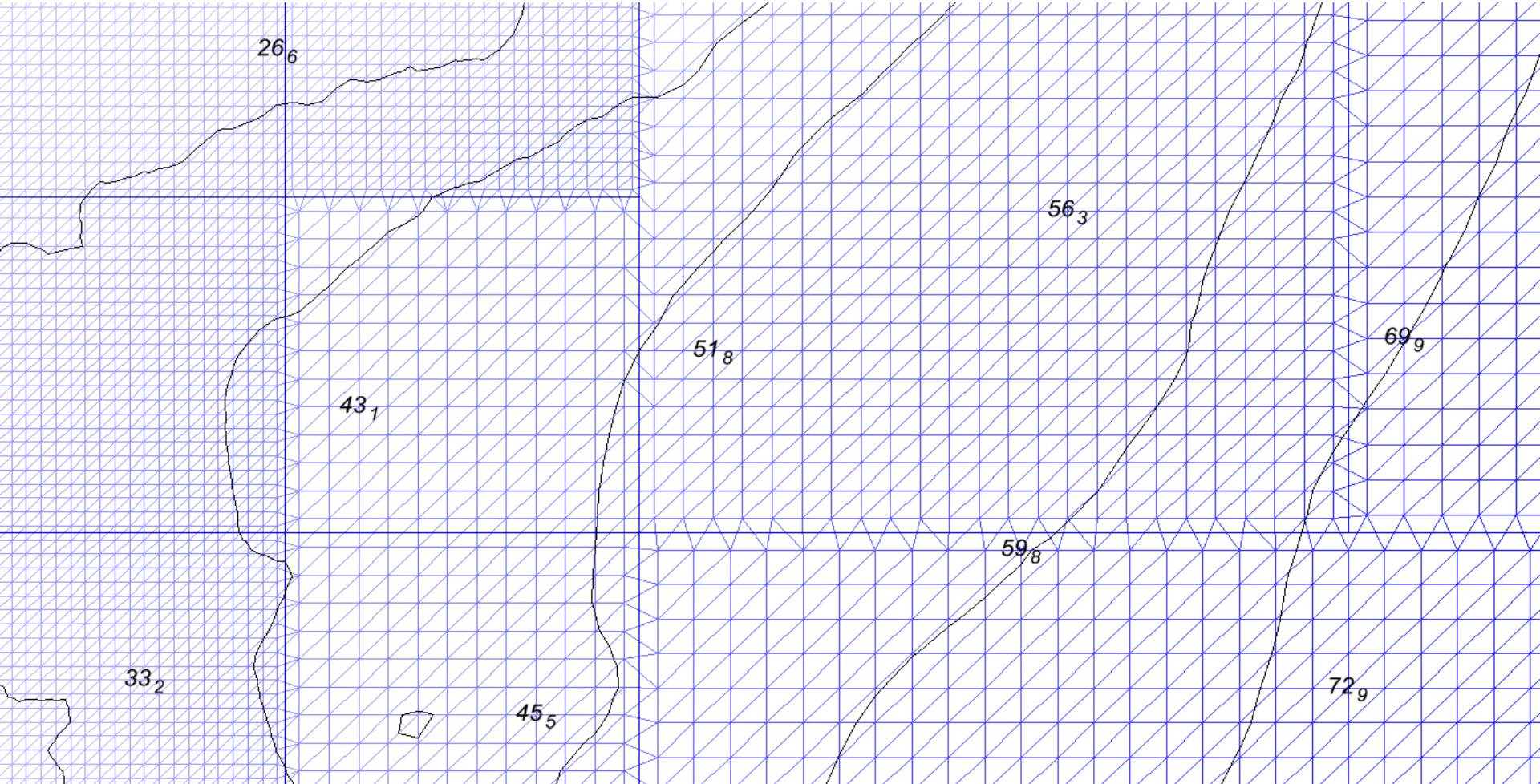


VR Surface – Resolution Map

VR - CARIS Workflow Integration



VR - Contouring & Sounding Selection



VR – First release & Future Considerations

- First release in CARIS HIPS and SIPS 10 (Q3 2016). CARIS Bathy DataBASE early 2017.
- VR built on a flexible framework, ready for the future
- VR is a new technique developed based on a need in the hydrographic community
- Further development also depends on user input

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