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Discrete Global Grid Systems – A Framework for the Next Era in Big Earth Data
A New OGC Standard Digital Earth Spatial Reference System

OGC DGGS Standards Working Group
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Poster Presentation by Perry R. Peterson, B.Eng., President PYXIS, Canada (ppeterson@pyxisinnovation.com)
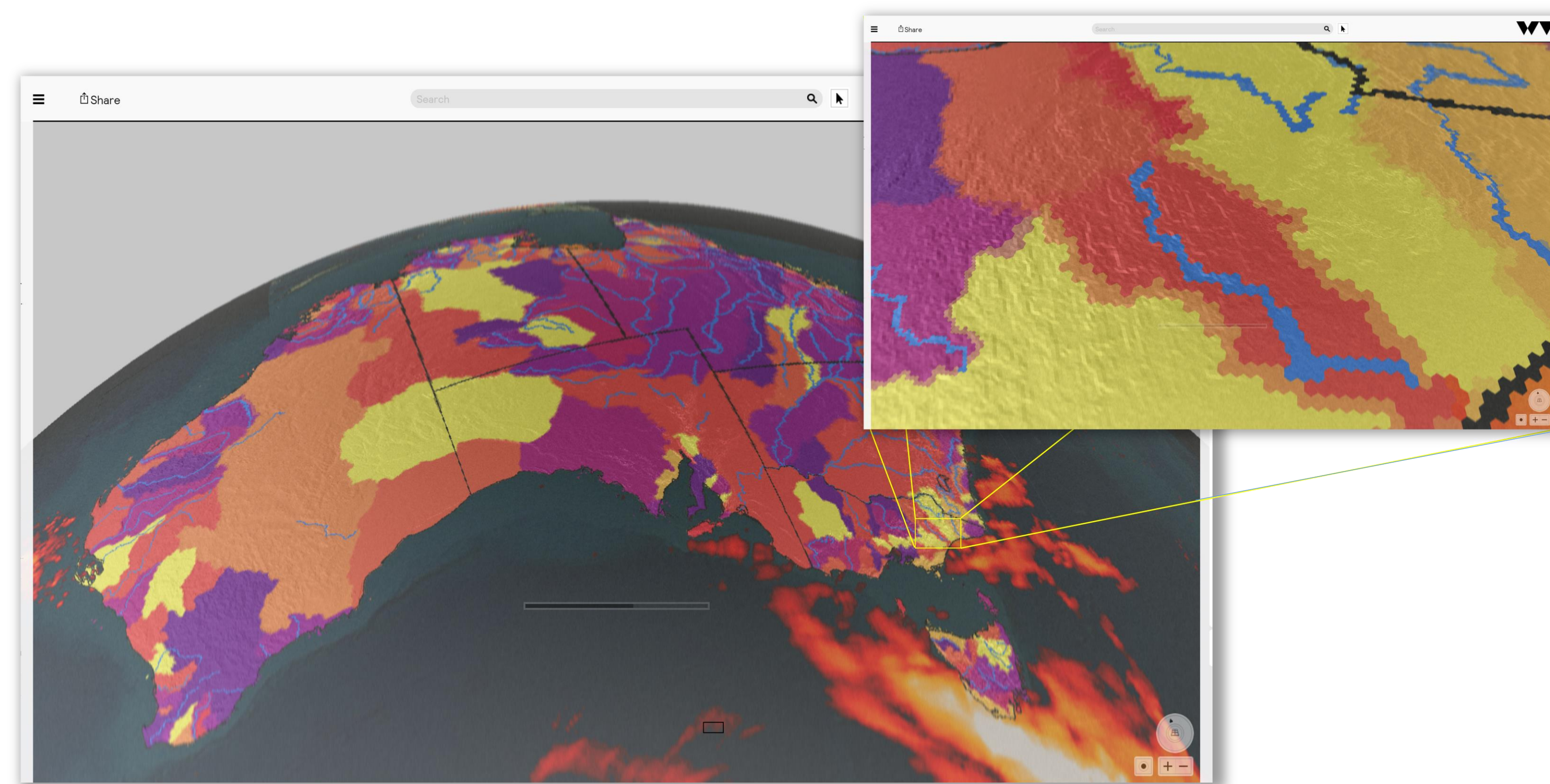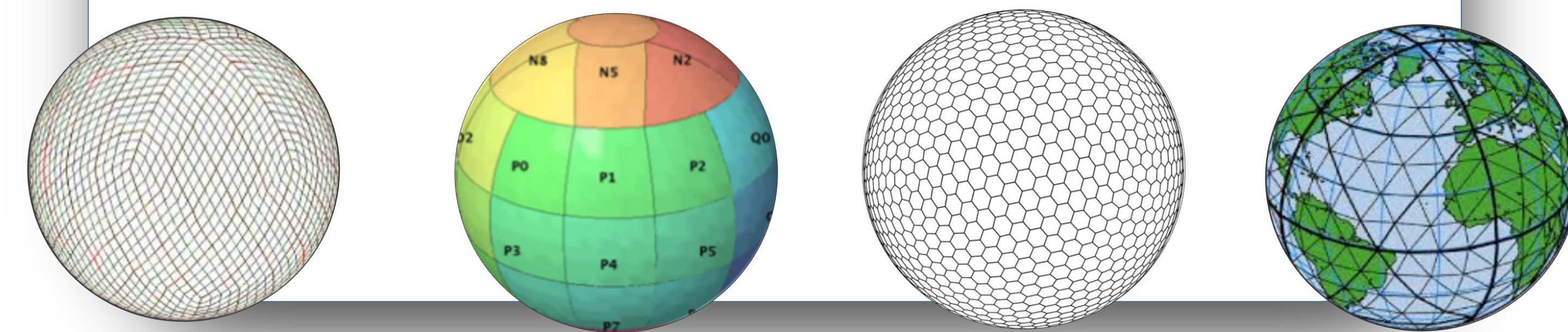George Percivall, M.Sc. CTO Open Geospatial Consortium

What is a Discrete Global Grid System?

A Discrete Global Grid System (DGGS) is a spatial reference system that uses a hierarchical tessellation of equal area cells to partition and address the globe.

A DGGS is characterized by the properties of its:
- **Cell structure,**
- **Geo-encoding,**
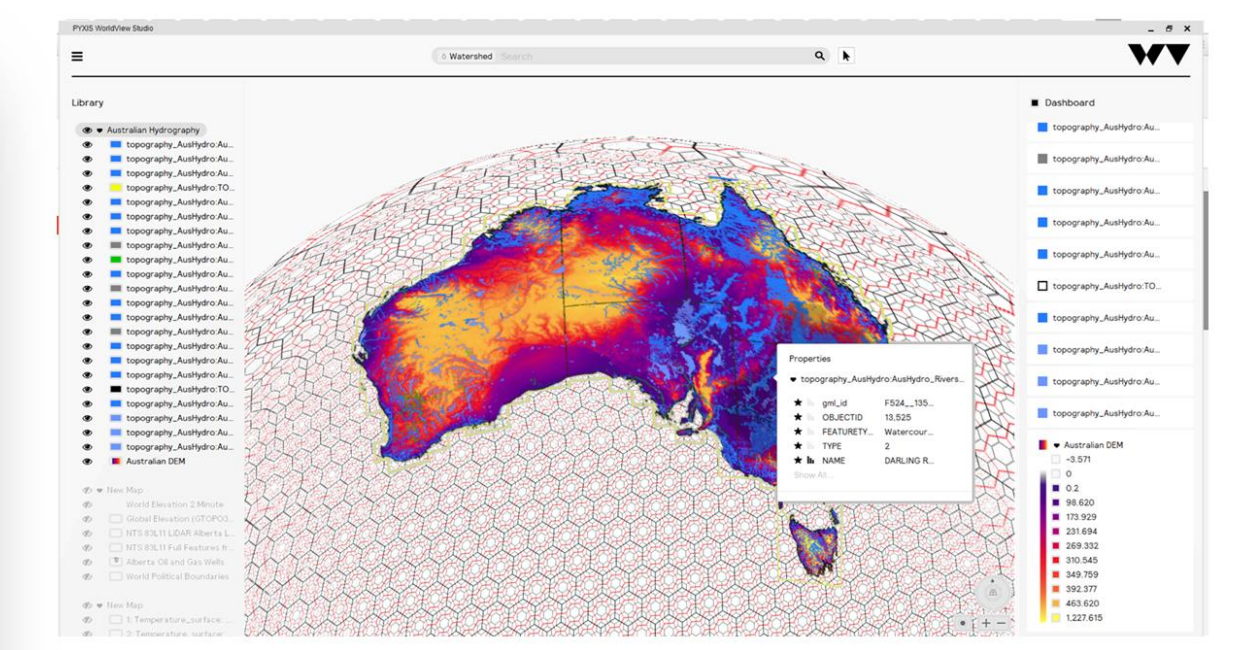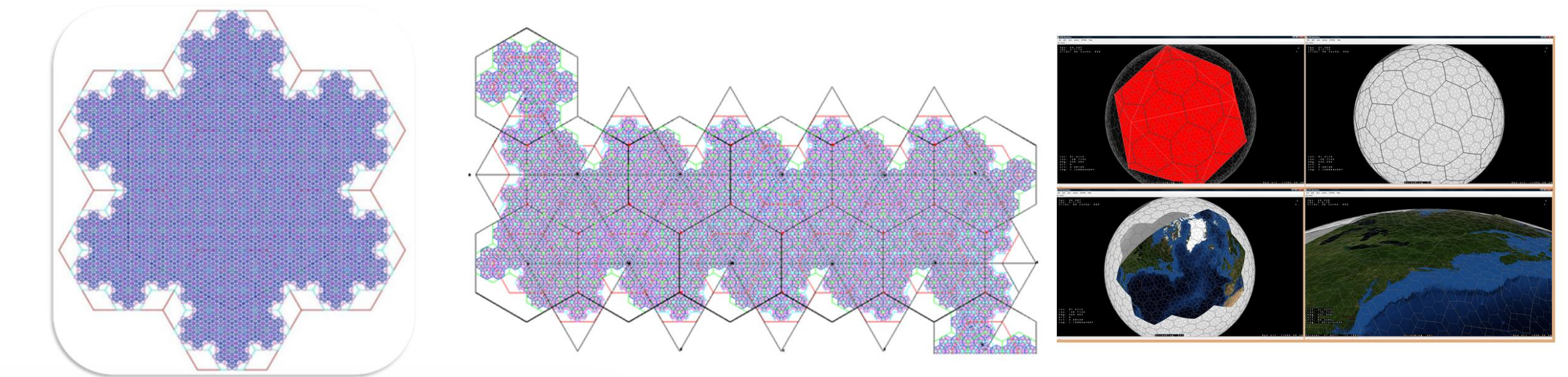- **Quantization strategy,** and
- **Associated mathematical functions**.

See DGGS in Action

www.WorldView.Gallery

A DGGS is designed to be an information grid not a navigation grid.

Information integration, decomposition, and aggregation can be optimized in the hierarchical structure, which is exploited to support data processing, storage, discovery, transmission, visualization, computation, analysis, and modeling.

Data Values are Stored in Infinitesimal Cells

Notable Criterion

Choice of Cells

There are **many possible DGGS**, each with their own advantages and disadvantages.

Criteria for choosing an appropriate tessellation include properties of **shape, adjacency, connectivity, orientation, self-similarity, decomposability,** and **packing properties.**

There are only three shapes that provide regular tiling of the plane: **quadrilateral, triangle, and hexagon.**

**Essentially, squares are familiar, triangles are fast, and hexagons the finest fit.**

Equal Area Partitioning the Earth

The generation of a tessellation over a representation of the Earth is mathematically intensive.

Most methods start with regular **polyhedron** and then **project** the cells to the sphere.

Preservation of cell area is an essential trait when a DGGS is intended to represent information consistently across the entire globe at the same resolution.

Tetrahedron   Icosahedron   Dodecahedron   Octahedron   Cube
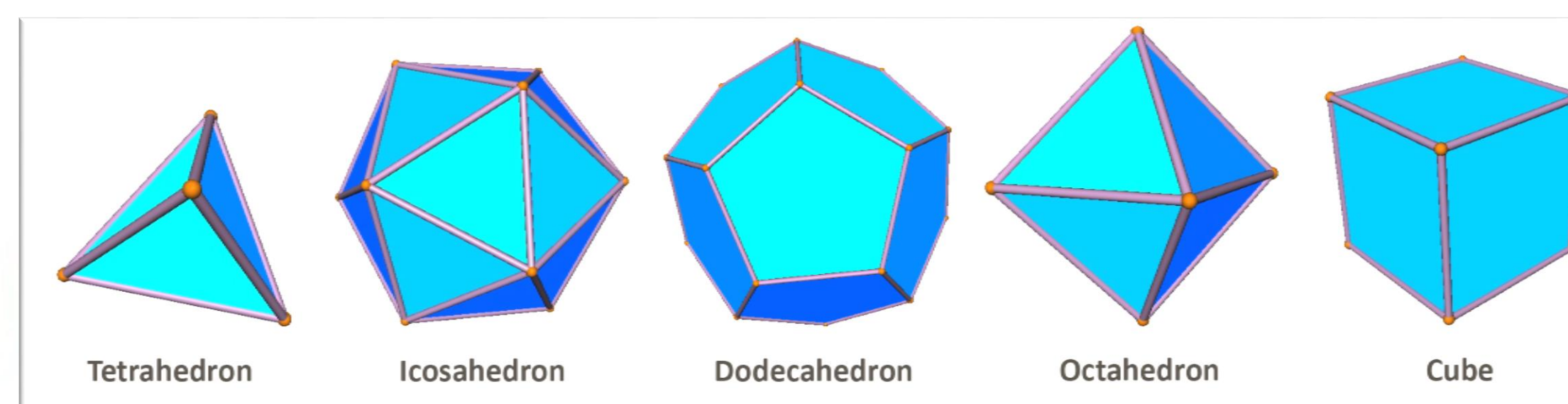
Uniquely Index Each Cell

Each cell must have a unique identifier.

Hierarchy-based, space-filling curves, and **axes** methods of indexing have been used to uniquely address cells.

Indexing that provides **nearest neighbour, fast linear ordering,** and **parent-child relationships** are the most common.

Indexing types can generally be transformed from one to the other.