**Unstructured Grid Breakout Notes**
**Breakout #4, Wed May 25, 3:30-5:00pm**

Participants
Rich Signell (USGS, Woods Hole, MA)
Dave Blodgett (USGS, Middleton, WI)
Bert Jagers
Charlie Zender
Jessica Hausman
Ajay Krishnan
Ben Koziol (NOAA-ESRL, Boulder, CO)
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Presentations

- Rich Signell and Bert Jagers gave a [presentation reviewing the motivation and history of UGRID and SGRID](#)

- Ben Koziol gave a [presentation on using UGRID to store polygons in NetCDF](#), the polygons representing NHD+ catchments.  This was to facilitate regridding from catchment regions to rasters using the ESMF regridding tool.

Discussion

Should UGRID and SGRID conventions be merged into CF?

After some discussion, it seemed that there are distinct advantages of not merging UGRID and SGRID conventions into the main CF document:
- More rapid UGRID/SGRID conventions development
- Allowing generic CF clients not to have to handle UGRID/SGRID.
- Keeps main CF document simpler

Dave Blodgett pointed out that this is already looking like the OGC core and extension model and seems like a good approach. That said, CF (both the CF-community and OGC SWG), needs to embrace extension of the core spec and specify how to do it responsibly.

Charlie Zender:   Could a group using another set of netcdf unstructured grid conventions (e.g. *EXODUS* II) be UGRID compliant?
Rich Signell:  They may be able to just add the UGRID attributes.

Mark Hedley wondered whether the existing UGRID conventions would handle higher-order elements such as those found in some finite element models.  Bert Jagers replied that the existing UGRID does not handle this yet,  but that some work has been done working with David Ham, who needs this for the ICOM model.  The group agreed that discussion of these higher-order element issues are enough different to warrant creation of a new google group or github repository to discuss issues, so as not dilute/confuse the discussion of regular UGRID convention issues.

This brought up the question of relationship between UGRID/SGRID and GRIDSPEC.  Currently there is none, but there was recognition that perhaps GRIDSPEC could help or help inform how to connect up 1D ugrids (e.g. rivers) to 2D ugrid (e.g. estuaries),

**Action Items**

With CF community, explore the OGC core and extension model for use with UGRID and SGRID.  CF (both the CF-community and OGC SWG), need to embrace extension of the core spec and specify how to do it responsibly. *Interested parties: Rich Signell, Dave Blodgett*

Create a new repository on the [UGRID github org](#) for discussing issues surrounding UGRID for higher-order elements, like many finite-element models.  (Some initial work on this from Bert Jagers and David Ham is on this [Finite Element Deltares Wiki page](#). )
*Interested parties: Mark Hedley, Bert Jagers and David Ham*

For existing UGRID, allow option for ragged arrays in 2D flexible mesh representation.  In other words, use the enhanced data model of NetCDF-4 to allow for VLEN (variable length) specification of the connectivity array.  *Interested parties: Ben Koziol, Rich Signell, Bert Jagers*

Develop conventions for best-practice handling of polygons in UGRID (but likely these actions should be covered by the new "simple features in netcdf" working group):

- Define break value attribute names and default values.
    - Polygon break value - Negative integer value inserted in the "node_coordinates" array to indicate face separation. When interpreted, faces separated by the break value should be treated as a collection or multi-part geometry.
    - Hole break value - Negative integer to indicate the "node_coordinates" following the break value should be treated as a hole in the preceding polygon definition.
- Allow option for ragged arrays in 2D flexible mesh representation.

*Interested parties: Ben Koziol, Dave Blodgett*

Explore whether  EXODUS II unstructured grids could be represented as CF-UGRID using NcML.  *Interested parties: Charlie Zender, Rich Signell*