Initial Proposal for addition of StructuredLevel_t node to SIDS

The StructuredLevel_t node would be an optional node located under
any or all of the following nodes:

FlowSolution_t
DiscreteData_t
ZoneGridConnectivity_t

Its usage is as follows:

Label = StructuredLevel_t
Dimensions = 1
Dimension Values= IndexDimension
Data =Integer = array of indices indicating the grid level UNDER the fine (GridCoordinates_t) level that the solution is being given, for each of the index dimensions: (indexi,indexj,indexk) given for 3-D; (indexi,indexj) given for 2-D; (indexi) given for 1-D

The number 1 indicates no change (fine level)
The number 2 indicates 2nd level (every 2nd point)
The number 3 indicates 3rd level (every 4th point)
The number 4 indicates 4th level (every 8th point)
etc.

The values of (indexi,indexj,indexk) affect the values of VertexSize and CellSize passed into and expected by the FlowSolution_t and DiscreteData_t nodes. Each new index dimension is determined by:

(IndexDimension-1+(2**(indexn-1))/(2**(indexn-1))

Each new CellSize is determined by:

(NewIndexDimension-1)

or (IndexDimension-1)/(2**(indexn-1))

If StructuredLevel_t does not exist, then the fine level (1,1,1)
is assumed.

1. Addition for Flow Solutions or Discrete Data

Here is an example:

Say the fine level grid in a particular zone is 3-D with the following index sizes: (i,j,k) = (257,97,3) (CellSize is (256,96,2).)

If the user wishes to output a solution on a COARSER level of the grid in i and j, then the data in StructuredLevel_t would be: (2,2,1) This would mean that the solution is expected to be given on a (129,49,3) grid, which is every-other point of the fine grid in the i and j indices. (The CellSize expected is (128,48,2).) In this example, the solution

is still given for the fine level in the k-direction. To output a solution on every-other point in ALL 3 directions, the data in StructuredLevel_t would be: (2,2,2) and the solution would be expected on a (129,49,2) grid (CellSize of (128,48,1)).

There may need to be some internal checks in the software to disallow illegal coarser grids. For example, if the fine grid is a (1,97,65) and the data in StructuredLevel_t is given as (2,2,2), learly the i-direction cannot be coarsened below 1. Also, if fine-level index is not a multigriddable number, there may be
problems when trying to create coarser levels. For example, fine grid of size (255,95,33) can be reduced by one level to (128,48,17) using StructuredLevel = (2,2,2), but StructuredLevel = (3,3,3) is not allowable!

The StructuredLevel_t node does not apply for unstructured grids.

2. Addition for Grid Connectivity

Some codes may require zone connectivity information not only for the finest level of the grid (already provided for in SIDS), but also for coarser levels as well.

This can be provided for as follows:

Allow for MULTIPLE ZoneGridConnectivity_t nodes under each Zone_t node. Each ZoneGridConnectivity_t would default to the naming convention ZoneGridConnectivity#, or be allowed to have a user-defined unique name. If there is only one, then it is assumed to give information for the finest level of the grid (defined by GridCoordinates). If there are more than one, then each ZoneGridConnectivity_t node MUST have a StructuredLevel_t node under it, describing which grid level it is giving the connectivity information for. Different ZoneGridConnectivity_t nodes under the same Zone_t node should not have the same StructuredLevel_t indices.

The usage of the StructuredLevel_t node is the same as described above. Again, the StructuredLevel_t node does not apply for unstructured grids.