IJK structured mesh implementation in Trio_U

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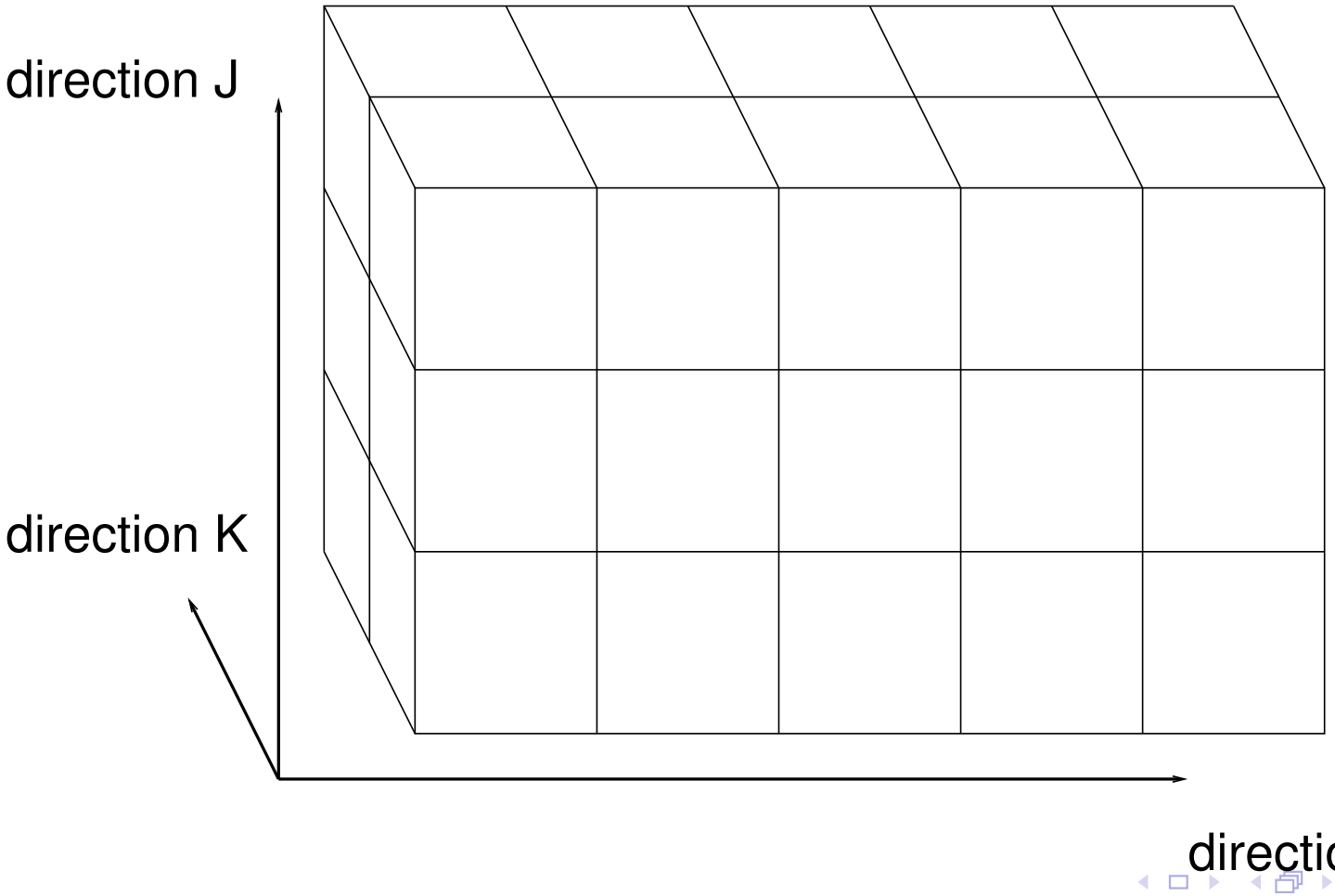
Mesh geometry

The global mesh geometry is stored in the `IJK_Grid_Geometry` class.

- Number of cells
- Cells sizes (constant or not constant for each direction)
- Periodicity flags



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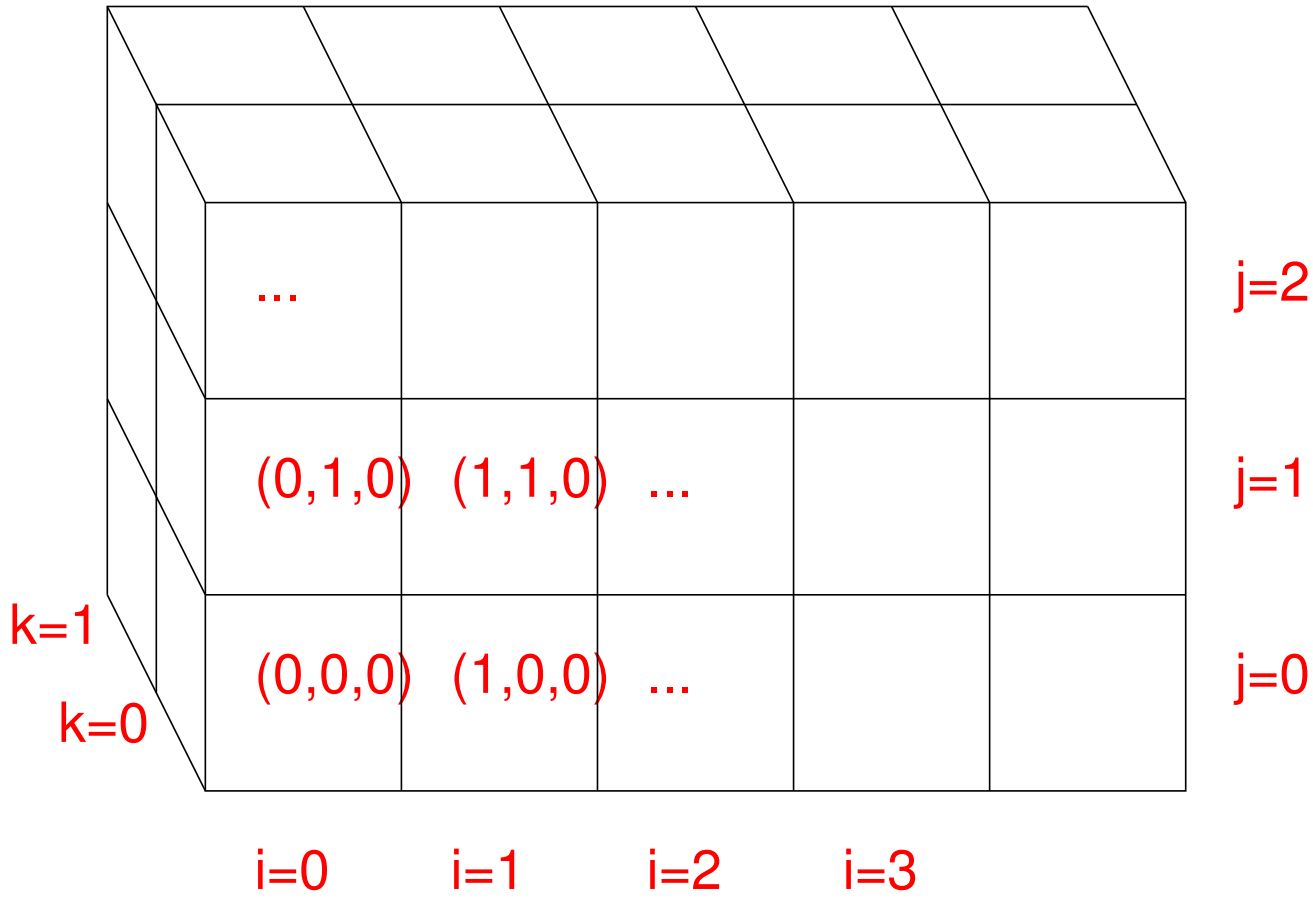
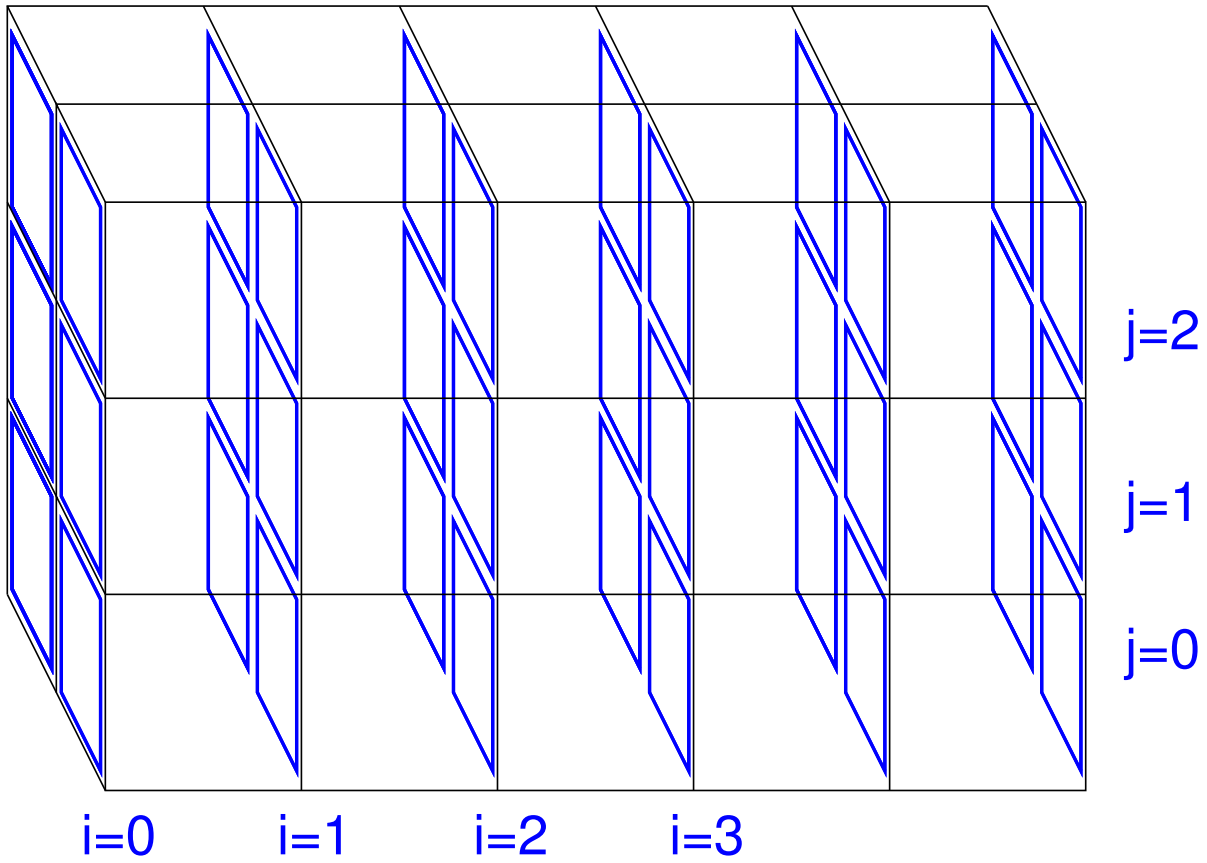


Numbering of faces

Face number (i,j,k) is at the "left" of element (i,j,k)



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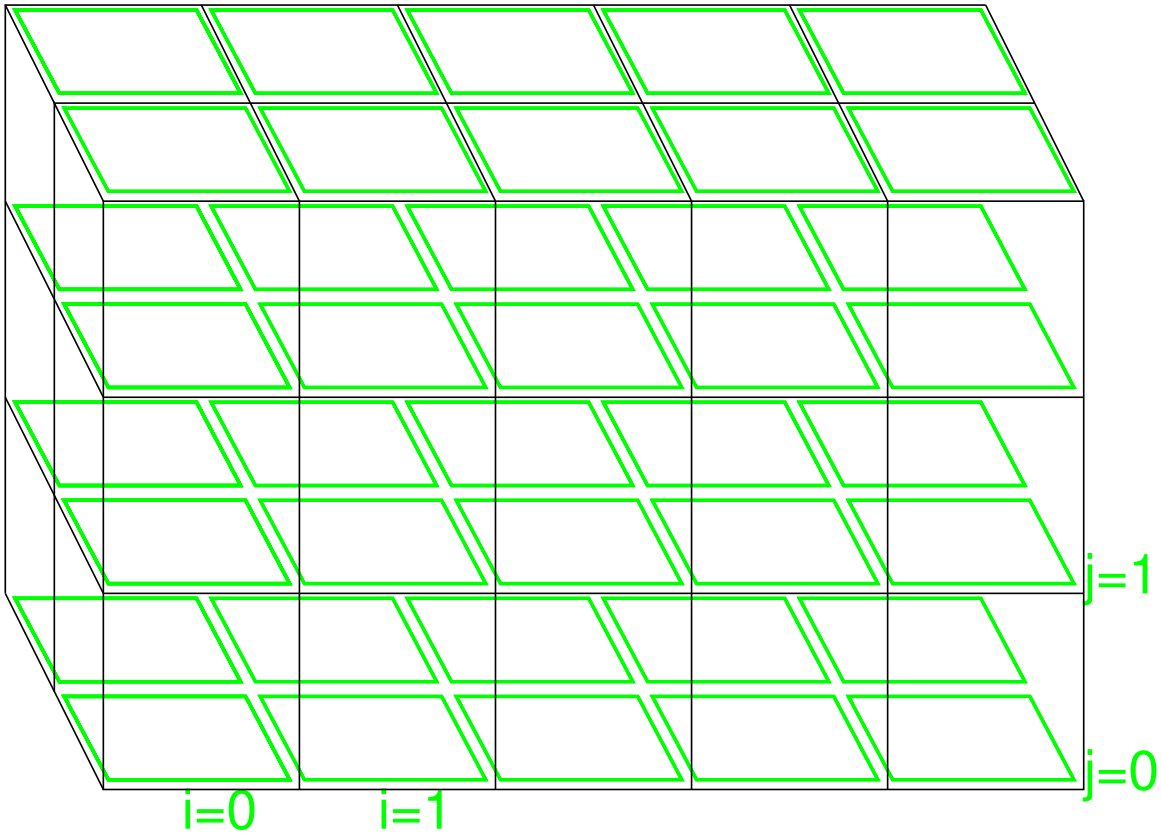

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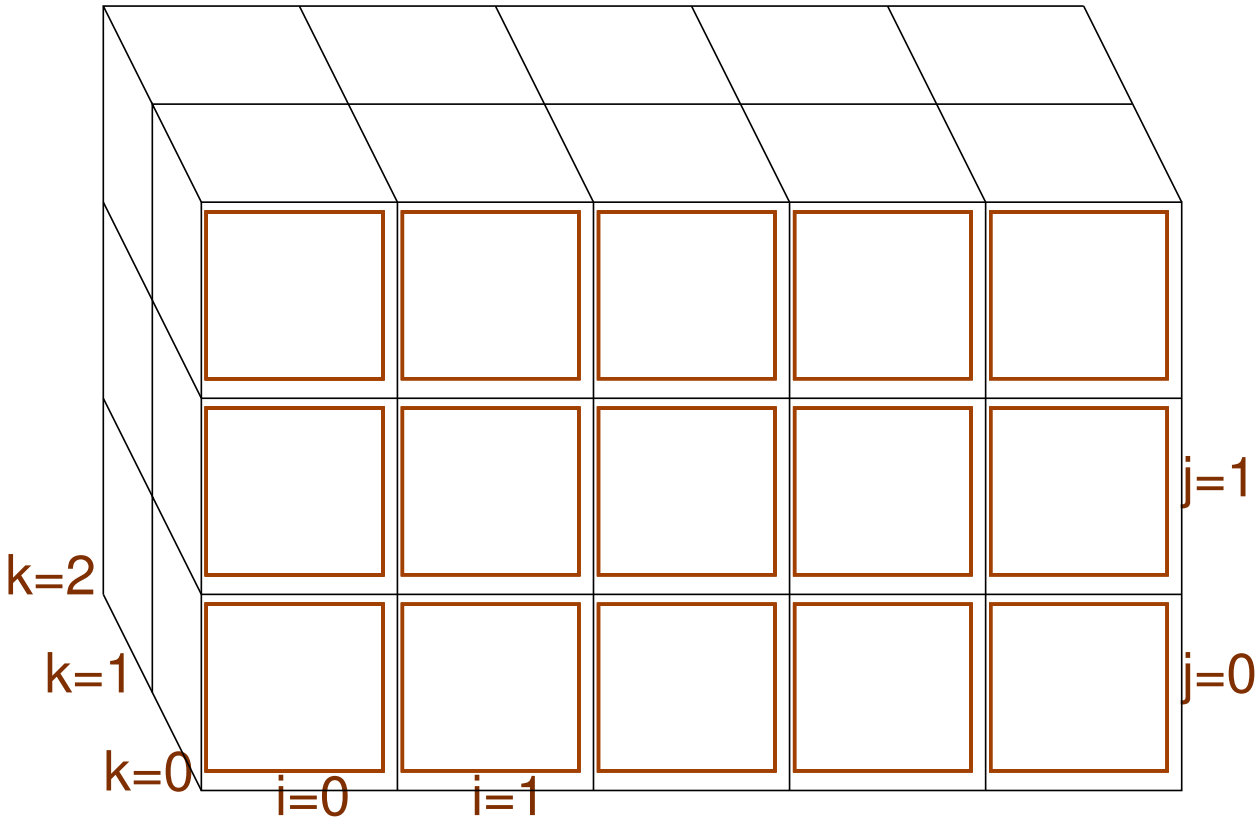
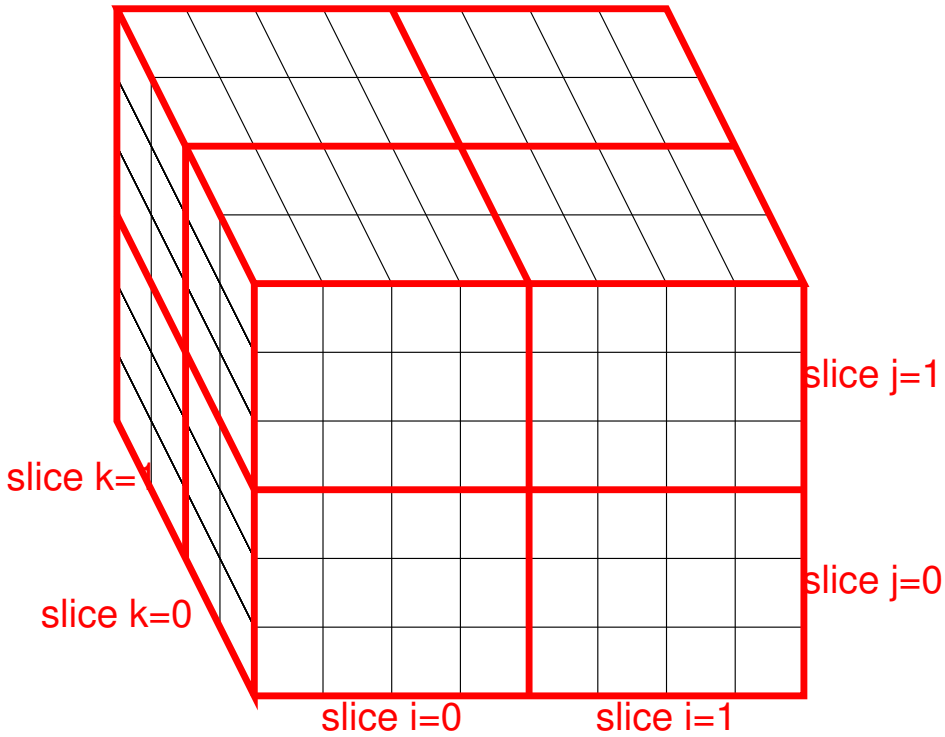


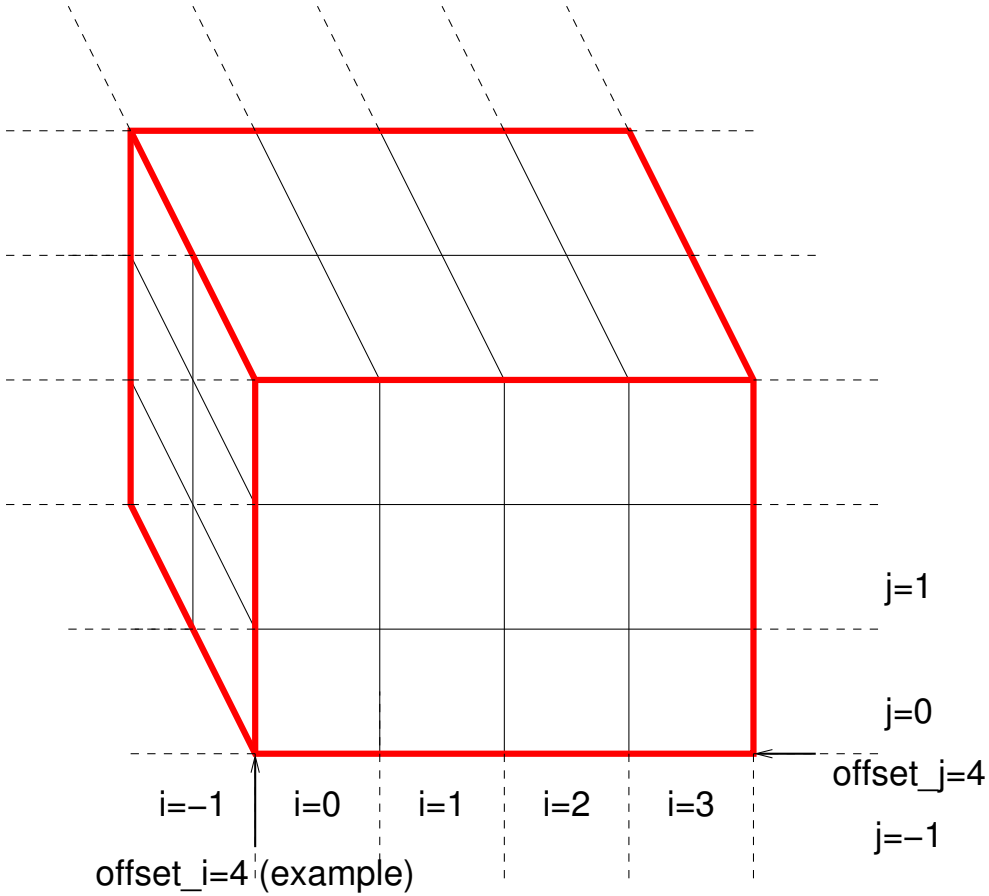
Mesh splitting

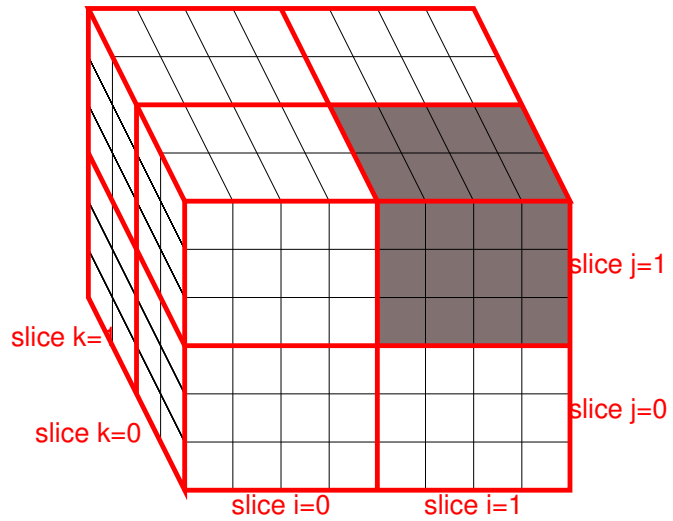
- The partitionning of the mesh is provided by the `IJK_Splitting` class.
- For the moment, only a "structured" splitting is supported (given number of slices in i, j, and k directions).



Splitting of elements

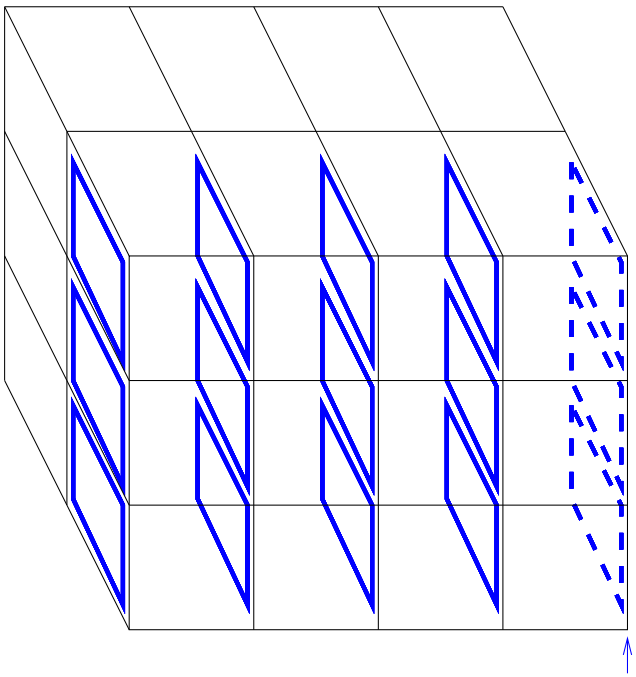
- Elements have local indices on each processor
- Global element/node/face index is obtained by addind the “offset”
- Negative indices are “ghost” elements held by the neighbour processor
- Periodicity is handeled by “ghost” elements (even if there is only one slice)





Splitting of nodes and faces

- A node or a face belongs to one processor only
- The "right" face of the rightmost local element is a "ghost" face (except at the boundary of the global domain if not periodic...)
- In the example, `splitting.get_nb_faces_local(DIRECTION_I)` returns 4.



Fields

- The `IJK_Field_double` and `IJK_Field_float` classes hold a field of scalar values localized on a split mesh.
- The following localizations are supported: ELEM, NODES, FACES_I, FACES_J, FACES_K.
- On a processor, items are either "real" or "ghost" (but never "common"): the node or face at the right of the last element on a processor is a ghost node or face; it is real on the processor that owns the next block of mesh cells.