Apollo

Regions specification

Confidential

# Disclaimer

This specification is not, by any stretch of the imagination, complete. It will need to be revised several times before it is complete. Currently several major parts are either missing or incomplete. This disclaimer will be updated to reflect any change in these sections. Finally a specification is supposed to be a ‘living’ document and therefore never complete.

# Introduction

Defines the specs for regions, boundaries, models and materials.

Regions and boundaries define the areas in which certain

# Regions

The data in a dataset is contained in N regions (where N >= 1). A region is a section of N-Dimensional space in which the physics models do not change. Each region is bounded by M boundaries (where M >= 1). A region stores the following data types:

* Schedules
* Components + component links
* Variables
* Models
* Materials
* Metadata(?)
* Constraints(?)

The region will use the global data values for each of the data types the dataset stores, except in cases where the default is explicitly overridden, e.g. a user can decide that a specific schedule should be used in one of the regions while others use the default. Regions do not need to include all of the global data values, i.e. they may only link to a selected set of values.

If a dataset outsources some of its work to another dataset then the breaking boundary for work is always a region. In other words regions are never shared between datasets. It is possible to sub-divide a region (and as such have a parent region) for uses in Domain decomposition cases. From the users perspective only the parent region exists in this case.

Regions are an abstract concept. They do not describe the geometry (that's done elsewhere). They just describe how the different bits link together.

The API provides access to the graph that describes how all regions fit together and which bits link to what other bits.

Can 'apply' things to a region, e.g. materials. That gives the region specific properties etc.

# Region boundaries

A boundary defines the edge of a region and each boundary is linked to X regions (where X >= 1). The bounding for an N-dimensional model is:

* 1 or 2 regions per boundary for an N-1 dimensional boundary (e.g. 2-D face in a 3-D model)
* 1 - M regions per boundary for an N-2 dimensional boundary (e.g. 1-D curve in a 3-D model)

As with regions the physical models do not change on a boundary, however it is possible for a region to have multiple boundaries. Boundaries store the following data types:

* Schedules
* Components + component links
* Variables
* Models

Again as with regions boundaries can override the global values if this is desired. If a value isn't overridden then the global (dataset) value will be used.

Finally in case of Domain Decomposition the communication will take place on the boundary level. Internal boundaries may be created.

Boundaries are also abstract concepts. They only specify there is a boundary, not what the geometry looks like.

Moving boundaries?

Spitting boundaries?

# Models

\* Available models are determined by the available plugins. We don't have a single model that is being used by all the plugins, each plugin defines its own

way of dealing with a 'fluid' model.

\* Maybe have 'global' model, e.g. fluid (Navier-Stokes), and derrivatives of that?

# Variables

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# Materials