



Fig. 2. Two potential Boxfish configurations. Left: the user has three views, two of which share a filter on their information. Right: the user has moved the Filter 1 subtree under Filter 2, so that View 1 receives its data after both filters have been applied.

anywhere in the hierarchy, dynamically changing the presented data, as illustrated in Figure 2.

When elements are selected in one view, corresponding elements in other views may be automatically highlighted depending on their position in the hierarchy and the policies of each subtree. Though the elements shown in each view may not be the same, selection in one can induce selection in the others if projections from the first view exist.

III. BOXFISH VIEWS

Boxfish is designed to facilitate the addition of new views by unifying the processing and manipulating of input data and handling shared view actions such as coloring, highlighting and rotating. Details on writing a Boxfish view are available in the user manual. We briefly describe the initial set of Boxfish views.

Torus/Mesh 3D – Three-dimensional torus and mesh networks are represented in their conventional configurations. In the case of the torus, wrap-around links are shown from one of their two end-nodes. The location of this ‘seam’ in any of the dimensions can be selected arbitrarily. Attributes are displayed on nodes and links by color. Figure 1 (right) shows this view.

Torus/Mesh 2D – Three-dimensional torus and mesh networks are arranged on a 2D plane to eliminate occlusion and ease selection. To achieve this representation, some of the links are minimized or omitted. Users can change which dimension is minimized and which sets of links are omitted. All three configurations are shown in overview ‘minimaps’ that aggregate attribute values on the links. Like its 3D counterpart, attributes are shown in this view by coloring the nodes and links. This view is shown in Figure 1 (left).

Plotter – Boxfish’s default plotting module can create scatter plots and histograms of (potentially aggregated) data attributes. Attributes from one or multiple domains may be plotted against the elements or attributes of any domain for which a projection exists. The plots offer a familiar method of looking at the data and selecting features of interest which can then be automatically highlighted in other views.

IV. BOXFISH IN PRACTICE

Bhatele et al. [3] used Boxfish’s 3D torus view to help identify the cause of a scaling problem in SAMRAI [4], [5], an adaptive mesh refinement (AMR) library. Nodes that spent the most time in a load balancing phase appeared clustered in the 3D torus view, providing insight into the relationship

between the slower processes and overlay communication network being used.

Boxfish’s 2D torus view has been used to better understand network behavior [6], [7] in pF3D [8], [9], a multi-physics laser-plasma interaction simulation. The view showed the differences in traffic load in the various torus directions given various node mappings. The 3D torus view was also used [7] to verify the topological layout of sub-communicators under particular node mappings.

V. CONCLUSION

Intelligent visualization of performance data can yield insights necessary to optimize applications. Utilizing projections across the multiple domains which affect overall performance enables the discovery of interactions between contexts. Boxfish manages these projections and visualizations for creative, convenient exploration of performance data.

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