Assignment #6: StreamGraphs

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1 Data Source (ROSS)

In this assignment, we have decided to generate/collect data from our ROSS research projects. ROSS is a massively parallel discrete-event simulator that can process billions of events per second [2], [1]. ROSS models are made up of a collection of logical processes (LPs). Each LP models a distinct component of the system. LPs interact with one another through events in the form of time-stamped messages. An MPI task is abstracted as a processor element (PE) in ROSS. Each PE owns a number of LPs and schedules events in time-stamp order for all LPs assigned to it. Events that are destined for a logical process on another PE (i.e. remote events) are sent as MPI messages.

For this assignment we decided to collect remote event data for each PE in the simulation. Running with 8 total PE's we collect the total number of MPI messages sent per PE at each instance of simulation time. The first dataset is generated with a simulation using the Dragonfly network interconnect model with uniform random traffic using minimal routing. The second dataset is generated using a Slim Fly network interconnect model simulation also using uniform random traffic and minimal routing. The data is extracted into a simple csv format with the following layout: PE#, sim-time, remote-events. We started of collecting 1,000 points in time for each PE but the resulting streamgraphs looked terrible (very discrete and spiky instead of smooth and continuous) so we dropped the number of time samples down to 100 per PE for a total of 800 points per graph.

2 Bar Graph Visualization

3 Stream Graph Visualization

Using the William Turman's Stream graph D3 implementation [3]...

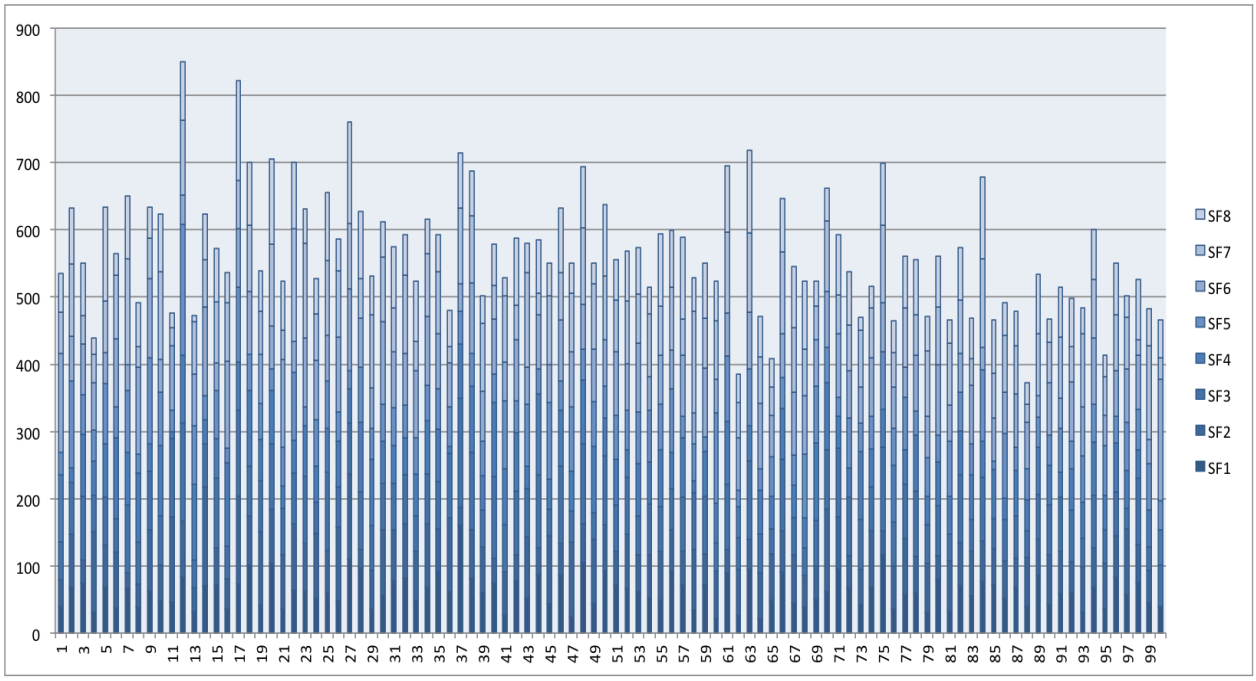
4 Bar vs Stream Graph Comparison

References

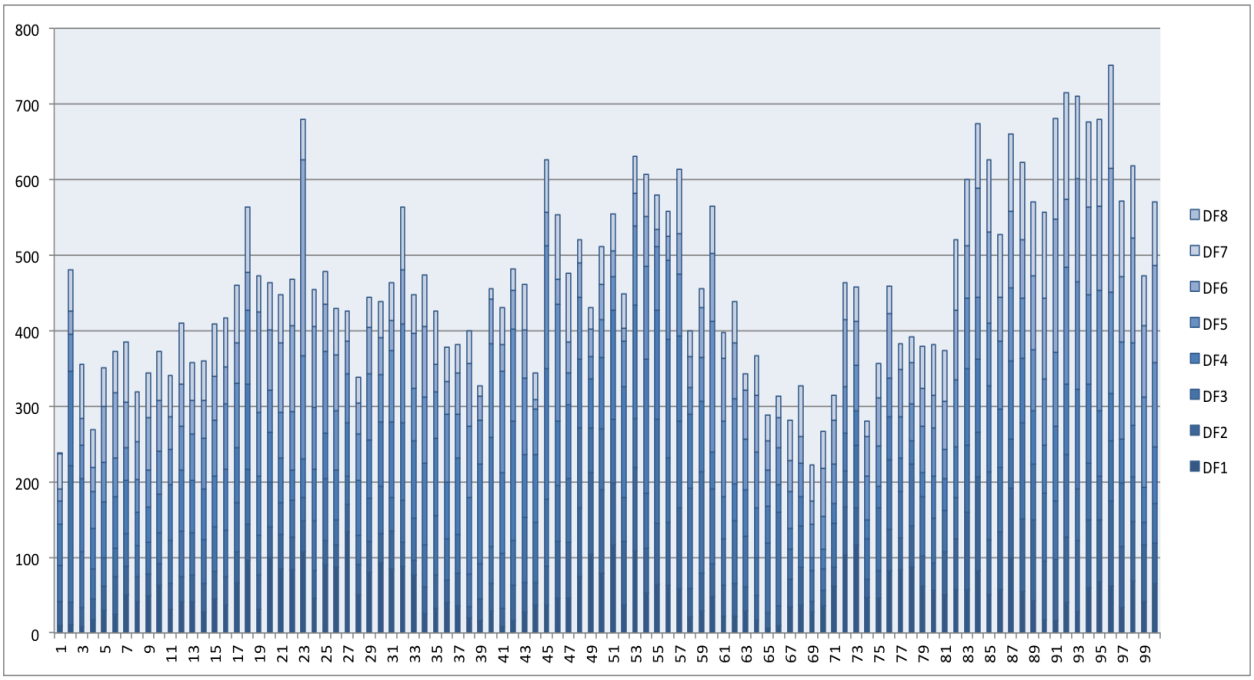
[1] D. W. Bauer Jr., C. D. Carothers, and A. Holder. Scalable time warp on blue gene supercomputers. In *Proceedings of the 2009 ACM/IEEE/SCS 23rd Workshop on Principles of Advanced and Distributed Simulation*, PADS '09, pages 35–44, Washington, DC, USA, 2009. IEEE Computer Society.

[2] A. O. Holder and C. D. Carothers. Analysis of time warp on a 32,768 processor ibm blue gene/l supercomputer. In *in 2008 Proceedings European Modeling and Simulation Symposium (EMSS*, 2008.

[3] W. Turman. D3 interactive streamgraph. `http://bl.ocks.org/WillTurman/4631136`. Accessed: 2016-03-18.



(a) Slim Fly



(b) Dragonfly

Figure 1: Visualizations of the Dragonfly and Slim Fly remote message simulation data sets showing the number of MPI messages being sent from each PE in the simulation over time. Both figures start with PE 1 (”SF1” or ”DF1” in the legends) on the bottom of the stacked bars and are presented in order to the top of the bars finishing with PE 8 (”SF8” or ”DF8” in the legends).