JET PROPULSION LABORATORY

INTEROFFICE MEMORANDUM
SFB: 363-88-003
August 8, 1988

To: Time Warp People

Re: The Need For More Nodes

From: Steven Bellenot

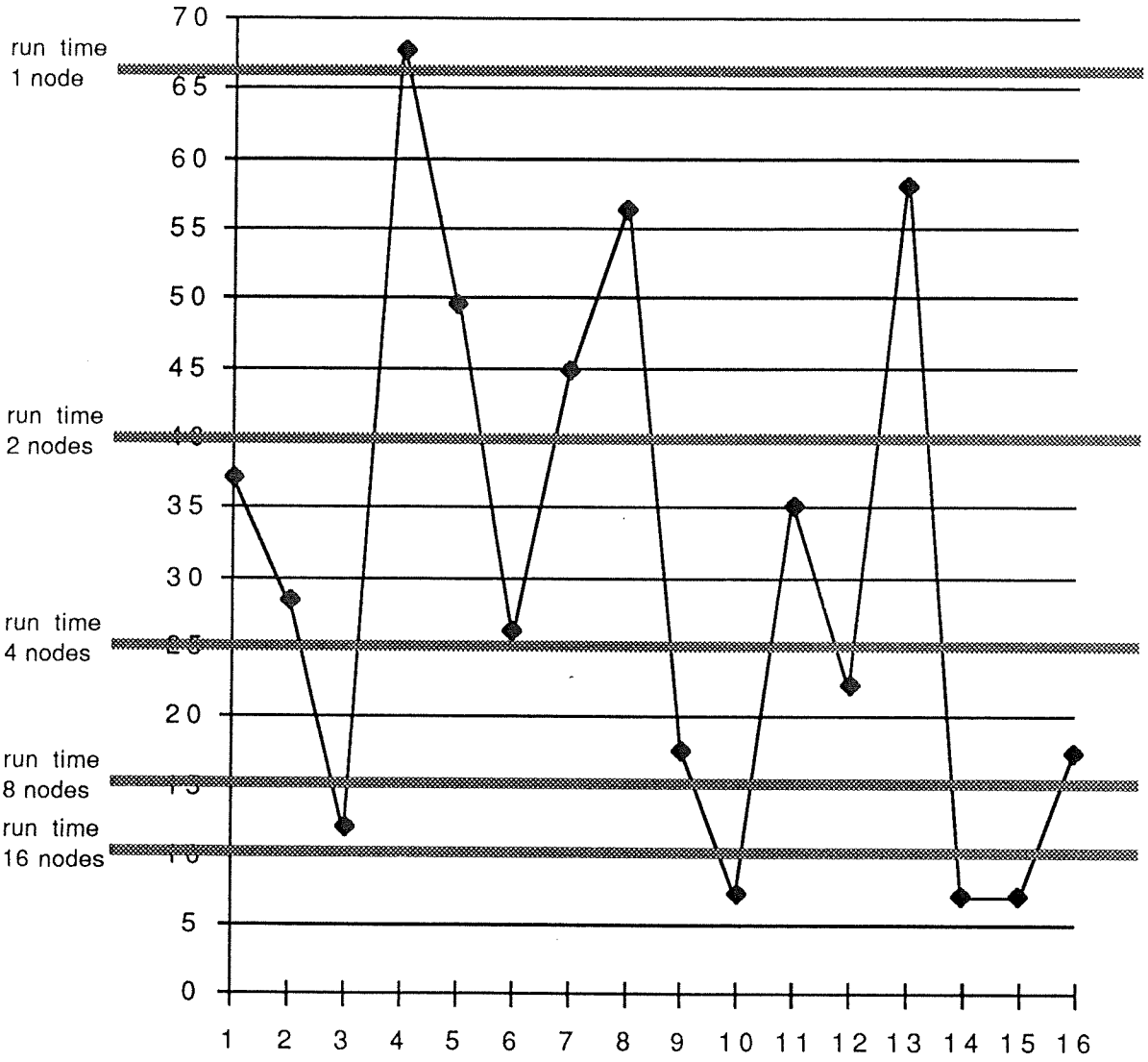
The following graph was made in May using the then current version of Time Warp (1.09). The graph shows an application (Slooow) which is well behaved on sixteen or fewer nodes, which is wildly erratic on 32 nodes. We still do not know what was special about 32 nodes. The next version of Time Warp (1.10), tamed this version (Mark One) of Slooow. In Time Warp 1.10, all 32 node runs finished in one GVT (5 second) tick. Thus Slooow has a speed-up of over 13, and theoretically a speed-up of 32 with no message delay. The application Slooow in all its versions is now well behaved on up to 32 nodes (the largest number on which it has been tested) using Time Warp 1.11.

Why is this a reason for wanting machines with as many nodes as possible? I claim this shows we are "living in a low dimensional world". By this I mean that we are running Time Warp on relatively few nodes, and we are going to be surprized by what happens when we start running on much larger number of nodes. The existence of application with a theoretical 32 fold parallelism but which could run slower on 32 nodes than on one node is at least somewhat surprizing.

We know there algorithms in Time Warp which do not scale. We are replacing many of them with algorithms which do scale. (For example, object location is replacing the worldmap.) Some algorithms we have decided are such a small percent of the run time, that they are not worth changing yet. (For example, the GVT collections). However, it is quite possible that there are many non-scaling parts of Time Warp that we don't know about yet, and some will only appear on large number of nodes.

Two summers ago, we were porting Time Warp to the Mark II hypercube. Each time we increased the hypercube dimension, we found new problems. Sometimes the code that caused a problem had comments about it which said the code was carefully designed to prevent a problem very similar to the one that it caused. I don't expect anymore Mark II type problems, by life still has its surprizes.

SLOOOW



Consequentive runs of the Slooow
Benchmark on 32 nodes with TW109

runs done 26 May 1988 on cpc5 by sfb