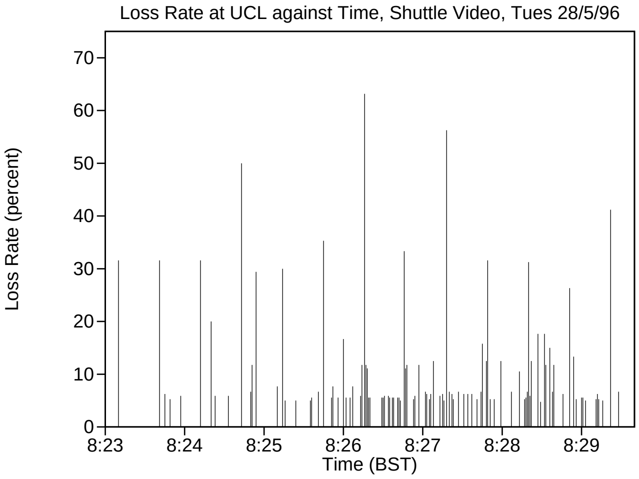

Figure 6: Loss Against Time

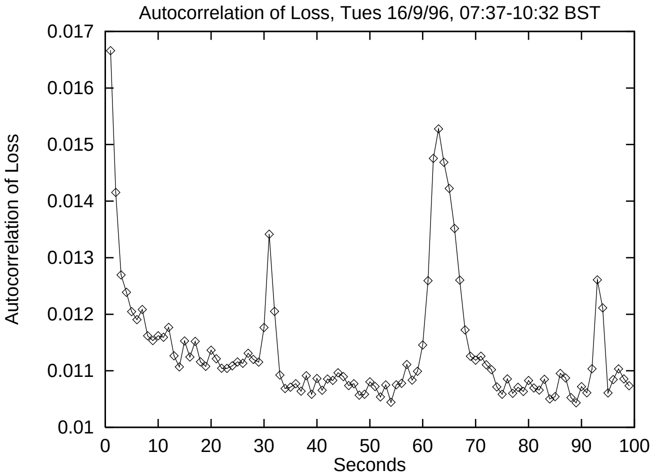

Figure 8: Autocorrelation of Packet Loss

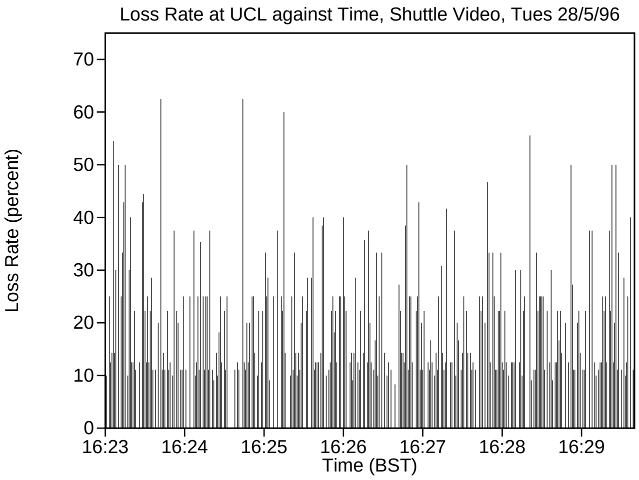

Figure 7: Loss Against Time

ning Solaris 2.5. Short dumps were also taken on an HP 9000/725 running HPUX on the same ethernet as the SS20, and a SparcStation IPX running SunOS 4.1.3 on a different ethernet at UCL. The effect is still visible on these traces. Test traffic sent through the UCL multicast router monitored on the same machines also does not show this effect.

This effect cannot be a periodic effect in the sending workstation at NASA because it would be visible in the RTCP receiver reports. At UCL, this effect is approximately 50% of packets being lost in one second, repeating every 30 seconds. This corresponds to approximately 1.5% loss, which is large enough to be reported by RTCP. We see significant numbers of receivers which report no loss, which rules out an artifact in the sending machine at NASA.

Such period loss patterns are likely to result from a periodic effect in the network itself. In the past, Van Jacobson has attributed similar effects to a bug in certain routers, where they invalidate their interface routing cache while processing routing updates, and to synchronisation of routing updates [9]. Although these seem likely there is not enough data in these RTP or RTCP figures to verify either hypothesis.

Both local tests and the absence of such effects for significant numbers of receivers tend to imply that this is not likely to be a ubiquitous artifact of DVMRP routing itself in the mrouted implementation. However, an interaction between multicast routing and some other periodic process on a tiny minority of workstations running mrouted cannot be ruled out from this data.

Loss Rate Distribution with Senders Data Rate

The graphs in figure 9 show the mean loss rate for each one minute interval calculated from the RTCP receiver reports plotted against an estimate of the sent data rate. This estimate is calculated by assuming that RTP packets missing when they arrive at UCL were of mean size. As vic tends to send close to constant size packets, this assumption appears justified. The data plotted in both cases represents a fourteen hour UK daytime section of video reception.

The lines plotted over this data are least-squares fits for each 50 minute interval in the source data. They attempt to illustrate whether any effects may have only been present for part of the sampled data, but they should be read as illustrative only, as there may be coincidental boundary effects such as a short period of low loss rate due to reduced cross traffic coinciding with a period of increased sender bandwidth.

In particular, the data from the Tuesday graph illustrates the difficulty of building a congestion control mech-