AppleTalk: Wide-Area Networking Issues Using Satellite Links

This article last reviewed: 31 August 1989

TOPIC ----------

I am working toward extending our AppleTalk network from Plano, Texas, to various other offices (such as, specifically, Anchorage via 56Kb phone links for Ethernet). This 'extended' Ethernet is primarily being done to support some VAX systems, but AppleTalk packets get out over the TransLan bridges anyway, so AppleTalk goes 'piggyback' on the Ethernet with no particular trouble.

So far, Plano and downtown Dallas are connected. There is Liaison and FastPaths on the Plano end and Liaison in Dallas. AppleShare servers and printers and zones show up fine, although response time is a bit slow.

In a few weeks, I hope to have Anchorage on-line via telephone satellite. I have been trying to get some idea of how bad the delay caused by the satellite phone link will be.

Are any software packages that make use of the ADSP protocol (which sounds to me like what we really need for eliminating the wait for every packet's response)?. For instance, I've heard that CE's newest QuickMail product does this. Based on the times involved, my estimate is that the time delay due to the 24,000 mile distance to the satellite will be slightly better than that seen with a Liaison remote phone link with a 9600-baud modem.

Is this reasonable, or is there some other problem I don't know about? Will AppleShare tolerate these time delays?

DISCUSSION ----------

A satellite link will add approximately a quarter-second delay between the time a packet is transmitted at one end of the link until the time it is received at the other end of the link. This propagation delay is about 15 times greater than that seen in a 3000-mile ground link, which approaches a fiftieth of a second. This assumes perfectly clean channels; when you include error rates, ground-based analog lines have greater error rates than satellites, which require more retransmissions.

The quarter-second delay would be most noticeable in the case of extremely bursty types of communications. The best example of this type of communication

is a full-duplex character mode terminal session. If the character typed at the terminal has to be echoed by the remote host before it is displayed on the screen, you see a one-half-second delay between the time a character was typed and the time it was displayed on the screen.

At the other end of the spectrum is the completely one-way transmission of large amounts of data. The quarter-second delay caused by the satellite link would then become virtually unnoticeable.

Reality will fall somewhere between these two scenarios. Typically, the amount of data transmitted in each AppleTalk packet will be in the hundreds of bytes. Also, constant send/receive-style communication is greatly reduced. For instance, communication between a Macintosh and a LaserWriter follows the pattern of 8 data packets being sent by the Macintosh, followed by a request for the next set of 8 sent back by the LaserWriter. This transaction-based communications is at the heart of most AppleTalk traffic.

AppleShare servers and LaserWriters communicate via the AppleTalk Transaction Protocol (ATP), which implements these communications along with guaranteed packet delivery. Using files servers and printers over this long distance link, as if they were locally attached, is not a recommended solution. However, we have seen these types of operations work reliably at speeds as low as 1200 baud via asynchronous links, so communications via the satellite link should work.

Problems that slower speed links cause often are caused by errors on the network. Satellite links themselves are very reliable, but if one of the ends of the link is having network errors, continual retransmission requests across the link, due to packets lost on the misbehaving side, will cause problems. This makes it doubly important that the quality of the networks on both sides be doubly checked and well within the recommended limits of cable lengths and nodes per network.

Also, in AppleTalk Phase 1, there is no best router algorithms in use, so sometimes a Macintosh will use a router on the other side of a slow link as its router to devices on its side of the link. This is a problem only with Macintoshes directly connected (via Ethernet cards, and so on) to the backbone that includes the long distance link, and it can cause significant delays. AppleTalk Phase 2 addresses this problem, and your customer should seriously consider upgrading to Phase 2.

To address the ADSP question above, ADSP is typically used for data-stream-type communications over a network. The classic example of this is terminal services over a network. ADSP was implemented to try to reduce the impact of the problems posed by the character-by-character nature of these transactions. We do not see a need to look for other network applications that specifically use ADSP unless you are looking at the possibility of terminal services across the remote link, such as logging on to a VAX via PacerLink.

It is important to realize that the actual throughput and user-perceived throughput will vary on a case-by-case basis. As the backbone traffic increases, causing more delays due to nodes waiting to send, the actual delay from the satellite link will become a smaller and smaller portion of the

overall delays on the network. If network services are configured to take the link into account, perceived throughput will be even greater. For instance, electronic mail services could be configured so that messages sent across the link were only sent twice a day at low-activity periods.

As a final note, the issues discussed above are mostly not AppleTalk- specific. Adding satellite links to any networking schemes magnifies the complexity of that network by an order of magnitude. This is definitely not a plug-and-play operation (not yet, anyway), but it has been successfully implemented within the AppleTalk world, and much more often in the TCP/IP world.

Keywords: <None>

==========

19960215 11:05:19.00
Tech Info Library Article Number: 4346