Network connectivity: A response to RFC #603

Network topology is a complicated political and economic question with
obvious technical overtones. I shall not attempt, in this note, to
cover all the possible arguments which might be made, but merely to
respond directly to the points raised in RFC #603.

   1. The important consideration in deciding whether it is good or
   bad to have a node (AMES) be four connected is not how many circuits
   are affected by a node failure; rather one should consider how well
   the network is still connected after a node failure. For example,
   if ALL nodes in the network were four-connected I doubt that anyone
   would argue that this was bad for reliability. The weaknesses are
   not the three-connected and four-connected nodes but rather the
   ONE-connected (Hawaii, London) and two-connected nodes. I must
   agree with Burchfiel's implied argument that it is better to have
   two adjacent three-connected nodes than to have a four-connected
   node adjacent to a two-connected node; unfortunately the realities
   of installing interfaces and common carrier services cause the
   Network to expand in sub-optimal ways.

   2. "Loops" are not good per se, they appear good because the act of
   making loops increases the connectivity and thereby reduces the
   effect of multiple failures. Adding more circuits costs ARPA money,
   both capital cost for IMP interfaces and recurring cost for the
   circuits. The network group at BBN has suggested to ARPA several
   times that "connectivity should be increased" but it was only late
   in December 1973 that we made specific suggestions for the locations
   of additional circuits. These recommendations were not based on
   building loops (although they may have that effect) but were based
   on breaking the long chains of IMPs which have occurred as the
   Network has grown. ARPA and NAC are now presumably in the process
   of evaluating our suggestions, and perhaps formulating other
   possibilities.

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