

traffic that comes down the pipe. Many departments, such as research, patents, and accounting, have information that they do not want passed outside their department. In such a situation, putting all the people in a department on a single LAN and not letting any of that traffic off the LAN makes sense. Management does not like hearing that such an arrangement is impossible unless all the people in each department are located in adjacent offices with no interlopers.

A second issue is load. Some LANs are more heavily used than others and it may be desirable to separate them at times. For example, if the folks in research are running all kinds of nifty experiments that sometimes get out of hand and saturate their LAN, the folks in accounting may not be enthusiastic about donating some of their capacity to help out.

A third issue is broadcasting. Most LANs support broadcasting, and many upper-layer protocols use this feature extensively. For example, when a user wants to send a packet to an IP address x , how does it know which MAC address to put in the frame? We will study this question in Chap. 5, but briefly summarized, the answer is that it broadcasts a frame containing the question: Who owns IP address x ? Then it waits for an answer. And there are many more examples of where broadcasting is used. As more and more LANs get interconnected, the number of broadcasts passing each machine tends to increase linearly with the number of machines.

Related to broadcasts is the problem that once in a while a network interface will break down and begin generating an endless stream of broadcast frames. The result of this **broadcast storm** is that (1) the entire LAN capacity is occupied by these frames, and (2) all the machines on all the interconnected LANs are crippled just processing and discarding all the frames being broadcast.

At first it might appear that broadcast storms could be limited in scope by separating the LANs with bridges or switches, but if the goal is to achieve transparency (i.e., a machine can be moved to a different LAN across the bridge without anyone noticing it), then bridges have to forward broadcast frames.

Having seen why companies might want multiple LANs with restricted scope, let us get back to the problem of decoupling the logical topology from the physical topology. Suppose that a user gets shifted within the company from one department to another without changing offices or changes offices without changing departments. With hubbed wiring, moving the user to the correct LAN means having the network administrator walk down to the wiring closet and pull the connector for the user's machine from one hub and put it into a new hub.

In many companies, organizational changes occur all the time, meaning that system administrators spend a lot of time pulling out plugs and pushing them back in somewhere else. Also, in some cases, the change cannot be made at all because the twisted pair from the user's machine is too far from the correct hub (e.g., in the wrong building).

In response to user requests for more flexibility, network vendors began working on a way to rewire buildings entirely in software. The resulting concept is