

## An Internet in the Ancient World?

By Dr. Gerard J. Holzmann

I have often wondered how people communicated over long distances before the days of the internet, or even the days of the telephone and the telegraph. **[Sidebar 1]** After all, also thousands of years ago there existed very large empires. Large armies, sometimes with more than a million people altogether, moved around to fight the wars of those times. How did these people stay in touch? A few years ago I decided to investigate. The results were rather unexpected.

The most ancient form of long distance communication is the use of professional runners: people specially trained and licensed to carry messages for a king or some other important official. This was common-place many thousands of years ago. The ancient Persians, in the 6th Century B.C., however, discovered that these runners were a prime target for robbers. They decided to set up hundreds of guard posts at regular intervals along the main roads in the Persian empire. Although these guard posts were at first only meant for the protection of the runners, an added benefit was quickly found. For one thing, a runner could now run at top speed from one guard station to the next (a distance of perhaps 10 miles), and then be relieved by another to cover the next distance. This was the beginning of the so-called *relay system*. Where appropriate or possible, the runner could also be replaced by a rider on horseback for optimal speed (this was not always possible because of the terrain). As a result of these improvements, the Persian system soon became famous in the ancient world for its speed and efficiency. It is reflected in this quote from the historian Herodotus (who lived in the 5th Century B.C.):

*Than this system of messengers there is nothing of mortal origin that is quicker. [...] And him [the Persian messenger] neither snow nor rain nor heat nor night holds back for the accomplishment of the course that has been assigned to him, as quickly as he may. The first that runs hands on what he has been given to the second, and the second to the third, and from there what is transmitted passes clean through, from hand to hand, to its end [...].*

(The U.S. Post Office adopted the first part of this quote as their motto.)

Having the system of guard posts, however, soon led to a much more important invention. Because from each guard post one could see the neighboring stations in the distance, it became possible to pass visual *signals* from one station to the next. For this purpose, the guard posts were equipped with fire beacons. At first, these beacons were only lit to announce major and expected events, like the birth of a new prince, a call to arms to fight a new war, or the victory over an attacker. It did not take long, though, before a more sophisticated signaling system was developed that could be used to transmit longer messages with the help of fire beacons. Such messages would travel across the ancient empires literally at the speed of light: not very different from today.

The best evidence that this type of long distance communication was well-known and in daily use even thousands of years ago is a description that can be found in the writing of

the Greek historian Polybius, who lived in the 2nd Century B.C. In Book X of his famous treatise *The Histories* Polybius not only describes in detail how the fire beacon signals worked, but he also gives a detailed account of a new invention: a torch *telegraph*! The telegraph was used send messages by spelling words. The Greek alphabet had 25 letters in those days. The letters were divided into 5 groups of 5 letters each. To encode a letter we need two numbers between 1 and 5: one to indicate a group, and one to indicate a letter within that group. To do this, all we need are ten burning torches and two screens that can be used to hide the torches from view. **[Illustration 1]** The two screens are setup a small distance apart, and five torches are hidden behind each screen. By raising between one and five torches above the left and the right screen, we can signal the group number (on the left) and the letter number (on the right) simultaneously. That's all there is to it.

Messages could be sent at a speed of approximately eight letters, or two words, per minute, over almost arbitrary distances (again in relays if necessary). This is how the Greek generals who were caught short of supplies or men hundreds of miles away from home could asked for reinforcements, or announce victory or defeat. Telegraphs of this type were used by the Greek armies for many centuries, and several variants and improvements were constructed. Can you think of an improvement? Can the same be done with fewer torches?

### **Sidebar 1**

The first usable electrical telegraphs were built in 1837, almost simultaneously in the U.S. (by Samuel Morse) and in England (by William Cooke and Charles Wheatstone).

The famous patent claim on the telephone was filed by Alexandar Graham Bell on 14 February 1876, just two hours before a very similar claim was filed at another patent office by Elisha Gray. Because of the two hour difference Bell won the rights to the invention.

The internet is a relative novelty: the construction of this network that connects computers worldwide was started barely thirty years ago as research project funded by the government. In the last few years its size has increased so immensely that it has started to have a real impact on the way many people communicate and interact.

### **Additional info:**

If you have any questions about ancient forms of communication, write to Dragonfly or send an e-mail message to: [gerard@research.bell-labs.com](mailto:gerard@research.bell-labs.com)