Photo: Diana Rogers, SLAC

Bringing the Internet to China

When I was at high school in England my favorite subject was geography/geology. However, fearing that jobs in geology might involve looking for oil in inhospitable places, with few encounters with the opposite sex, I switched to physics. Since then, I earned a PhD in nuclear physics, switched to high-energy physics, and then to computing and networking. More recently, working on monitoring Internet performance at sites in over 120 countries around the world in an effort to quantify the "digital divide", it appears whatever skills I had in geography have not gone to waste.

My first real exposure to developing countries was in early 1991 when I was invited to attend a meeting at Stanford Linear Accelerator Center with Chinese physicists to discuss the possibilities for computing and networking at the Institute of High Energy Physics (IHEP) in Beijing. Never having been to China, but with a conference trip to Tokyo looming, I wangled an invitation to try to set up a network connection from IHEP to SLAC. Somewhat at a loss to know exactly what I might expect in China two years after Tiananmen Square, and whether or how to proceed, I met with Pief Panofsky, director emeritus of SLAC. He was very encouraging, pointing out the important benefits that good networking could make to HEP and the collaboration between China and the United States.

At that time, IHEP had one fax line that could make international calls, plus a dial-up X.25 phone line to CERN in Europe that was mainly used for transferring mail twice daily. The very least I could do was to request that IHEP install three international phone lines in their computer center. Fearing bureaucracy would impede this, Panofsky enlisted Nobel Prize winner T. D. Lee to help get the phones and quickly obtain a visa for my visit.

On arriving at IHEP three weeks later, I met with the IHEP computing staff. They were excited about working with western "experts" and were determined not to let any lack of knowledge of English impede things. I was flattered by their attention, friendliness, and enthusiasm; challenged to make myself understood; and amazed and elated to find the phone lines had been installed the day before. I had brought with me, just in case, two modems, so I quickly attached one to the phone line and the VAX 785 computer. We used the second phone line to call Charley Granieri and others at SLAC to set things up and successfully call the SLAC modem pool. Over the next two weeks, after further experimenting, we set up a DECnet dial-up connection between SLAC and IHEP with an effective transfer rate of 400 bits per second and a cost of about $3 per minute.

After returning to the United States, we quickly convinced Bob Woods at the Department of Energy to fund an AT&T satellite circuit between IHEP and SLAC. However, from there on things started to get harder. It took over a year to get links from the satellite station at Beijing airport to IHEP. We tried numerous solutions including infrared and microwave transmission and eventually settled on optical fiber and copper. The satellite link was finished in March 1993 and was a big improvement, providing file copy rates of about 42,000 bits/s and transferring about 2500 email items per day. Word about the link quickly spread in Chinese academic circles; institutions started to connect to IHEP; and over 300 top academics from all over China got accounts at IHEP so they could email the rest of the world.

By this time it was obvious to us that the next step was to replace the DECnet access with full Internet connectivity. To do this required shipping to IHEP routers that required US Department of Commerce export licenses. After substantial paperwork and communications with the US Departments of Energy, Commerce, and Defense, the license was granted, the routers were received in Beijing in February 1994, and the link opened up to the worldwide HEPnet in March 1994.

The final step of connecting the link to the Internet was achieved on May 17, 1994, following required notification to all ESnet (Energy Sciences Network) sites that the Internet would be carrying Chinese network traffic. This was the first Internet connection to mainland China. The HEP community should be proud to have pioneered the connection: There are now about 100 million Internet users in China.

Les Cottrell

Les Cottrell is the assistant director of computing services at SLAC.