The Difference Engine: No more addresses

REMEMBER the panic over the "millennium bug", when computers everywhere were expected to go haywire on January 1st, 2000, thanks to the way a lot of old software used just two digits to represent the year instead of four? Doomsters predicted all sorts of errors in calculations involving dates when the clocks rolled over from 99 to 00. In the event, the millennium dawned without incident. That may have been because of the draconian preparations undertaken beforehand. Or perhaps, as many suspected, the problem was grossly exaggerated in the first place, as it often happens. Certainly, the computer industry made a packet out of all the panic-buying of new hardware and software in the months leading up to the new millennium. And who would blame them for this? Business is business.

Well, something similar is about to happen in the months ahead. This time, the issue concerns the exhaustion of Internet addresses — those four numbers ranging from 0 to 255 separated by dots that uniquely identify every device attached to the Internet. According to Hurricane Electric, an Internet backbone and services provider based in Fremont, California, the Internet will run out of bulk IP addresses sometime next week — given the rate addresses are currently being gobbled up.

The Internet Assigned Numbers Authority (IANA) will then have doled out all its so-called "slash-eight" blocks of addresses to the five regional Internet registries around the world. In turn, the registries are expected to have allocated all their remaining addresses to local network operators by October at the latest. After that, any organization applying for new addresses will be told, "Sorry, none left".

The issue is real and has been a long time in the making. The Economist first warned about it ten years ago. The problem concerns the address space of the existing version of the Internet protocol (IPv4), which is only 32 bits wide. The total number of binary addresses possible with such an arrangement is 4.3 billion. Back in the 1980s, when the Internet connected just a couple of dozen research institutes in America, that seemed like a huge number. Besides, the Internet was thought at the time to be just a temporary network anyway.

But with the invention of the Web in 1990 came an explosion in popular demand. It was soon clear that it was only a matter of time before the Internet would exhaust its supply of addresses. Work on a replacement for IPv4 began in the early 1990s, with IPv6 finally being made available around 1998. By giving the new internet version an address space of 128 bits, the designers pretty well guaranteed that it would not run out of unique identifiers for decades, or even centuries, to come.

Two raised to the 128th power is an astronomical number. That will come in handy when the "Internet of things" becomes a reality. Already, some two billion people have access to the Internet. Add all the televisions, phones, cars and household appliances that are currently being given Internet access — plus, eventually, every book, pill case and item of inventory as well — and a world or two of addresses could easily be accounted for. And yet, the solution of any problem begins with its verbalization. We are forewarned and it means — forearmed.

The number of available IP addresses is limited by...

1. ...the number of computers connected to the Internet.
2. ...the number of organizations applying.
3. ...address space of the Internet protocol.
4. ...the Internet protocol version.