

The internet at 40 Pioneers: Donald Davies

In 1965, physicist Donald Davies was Head of Computing at the National Physical Laboratory in London. His main concern at the time was how to use the telephone network to allow computers to communicate remotely with each other. A year or so before his death in June 2000, he gave an interview about his part in the history of the internet, for an Open University series called TheWebStory.com

Well it started like this. For the first ten years or more of their existence computers was a rare resource. It was something that you approached with great reverence and consequently everything depended on making the computer as efficient as possible and the poor person who was using them had to use them when the computer organisers had decided and where they decided you had to go to the machine. And so there were two problems really. You wanted a job done or information at a certain time and place and you couldn't get it. You had to go to the computer at the right time – or you're only given a certain amount of time – and it had to be actually on the spot. And those two restrictions were removed one by one. The first thing was done by time-sharing. For the first time in the early Sixties a computer was shared by a lot of people so that was an absolutely crucial development. It's so obvious now but something entirely new at that time. And the other thing was that people wanted to collaborate with each other through a computer. They wanted to be able to work on the same files in two different places so you didn't have to be in the same building in order to collaborate.

The problem was that communication between users in different locations involved a permanent costly connection between the two computers – usually a telephone line.

The problem was that the way that computers communicate between computer and computer, and particularly with a person interacting with a computer, tends to use short messages and require very immediate reply. Also it tends to have long pauses when it's not communicating anything because the computer is busy working or the chap is thinking about what to do next. He's sitting at his terminal thinking about his problem. So there tends to be a very inefficient use of the line and it struck me that the way to handle this problem was to treat the messages that had passed between computers and people rather like we treat the postal service where you send a message on or a letter on from one sorting office to the next and so on and eventually arrives at the destination; to treat it as a bunch of data rather than as a line which has a definite capacity which has been set up for this unique purpose.

Having reached that point the question arose how long would it take to get there. We had unfortunate experience from the telegraph network where that type of principle had been used and it took minutes or hours for the message to get there which would completely negate the whole purpose of time sharing. And so I had to look at what the reasons for that delay was and having analysed them I found there were several reasons including the speed of the line and so on but the one that was most critical was the length of the message because if you sent a mixture of long and short messages everything would tend to have a delay which was affected mainly by the long messages. So what you had to do was to chop the long messages up into smaller pieces, send them individually like individual letters and then reassemble them at the far end. That principle is called packet switching and the short message into which you break the longer one is called a packet. So once I'd thought about that and worked out some of the sums I found that even with the technologies that was then available you could get delays which was as little as a tenth of a second so nobody in practice would notice that they were there so you wouldn't interfere with the conversational aspect of time sharing and you would get what would be a effectively a real time network but one which really made good use of the line because you could send high data rates and low data rates

on the same line, cutting them all into packets and giving the user just what he needed, not occupying the line for long periods with silence.

And that was astounding you know. It was just completely different. I realised it was a terribly interesting and important new principle and a new way of communicating which hadn't been used before and I realised straight away it was something quite significant.

Donald wasn't the only one to come up with the idea of breaking long pieces of data into shorter packets.

Well in 1966 when I gave the very first public lecture on the subject and had this extremely good reaction from the Post Office, immediately after the lecture someone I knew came up to me and said, 'look, did you know that this whole idea had been thought out before by somebody called Paul Baran?' And of course I was rather knocked sideways. I went back and read Paul Baran's papers and surprisingly the exact mechanism including a method of routing packets around obstacles and so on and the size of packet and even the same kind of high speed line had been worked out in great detail but in a different context, a context of military networks where the essence was survivability. But it was a surprise to find that quite independently Paul Baran had hit on the same principle a couple of years earlier.

But it was the British team that first brought packet switching to the attention of the network pioneers in America.

We knew about the ARPA Network Project but they hadn't really begun to do very much. Then in 1967 we were invited to a seminar in Gatlinburg, Tennessee, and I sent one of my people to give a paper which we'd jointly written about our work and this was a very important Paper for the ARPA network because that was the first they'd heard of packet switching and it happened that it was the first time that they'd heard about Paul Baran's work either. So we actually not only provided the basic technology for the communication side of the ARPA network and therefore the Internet but also told them about what had been done before that in the USA.

I certainly feel proud of what I and my colleagues achieved, very much so. And I think among the so to speak specialists in the area I did get a lot of recognition in the form of you know Honorary Doctorates and things of that sort membership of societies. I got recognition. I think we made an early advance which was an essential part of the way the Internet developed and I wouldn't like that to be forgotten completely but on the other hand I wouldn't over emphasise our contribution to the project as a whole. It was far more than what we contributed, had to go in to it. We did a small essential part and I hope that will be remembered, yeah.