Die another Day? Or How Madonna crashed the Internet

When pop star Madonna took to the stage at Brixton Academy in 2001 for a rare appearance she made Internet history and caused more that a little Internet misery. Her concert performance was webcast; that is it was broadcast real time over the Internet. A record-breaking audience of 9 million tuned in, and that's where the trouble started...

The Internet's early career

The Internet started its career as a way of sending text messages between military bases. What was important was that the message got through, even if parts of the network were damaged say, during times of war. The vision was to build a communications system that could not fail; even if individual computers did, the Internet would never crash. The text messages were split up into tiny packets of information and each of these was sent with an address and their position in the message over the wire. Going via a series of computer links it reached its destination a bit like someone sending a car home bit by bit through the post and then rebuilding it. Because it's split up the different bits can go by different routes.

Express yourself (but be polite please)

To send all these bits of information a set of protocols (ways of communicating between the computers making up the Internet) were devised. When passing on a packet of information the sending machine first asks the receiving machine if it is both there and ready. If it replies yes then the packet is sent. Then, being a polite protocol, the sender asks the receiver if the packets all arrived safely. This way, with the right address, the packets can find the best way to go from A to B. If on the way some of the links in the chain are damaged and don't reply, the messages can be sent by a different route. Similarly if some of the packets gets lost in transit between links and need to be resent, or packets are delayed in being sent because they have to go by a round about route, the protocol can work round it. It's just a matter of time before all the packets arrive at the final destination and can be put back in order. With text the time taken to get there doesn't really matter that much.

The Internet gets into the groove

The problem with live pop videos, like a Madonna concert, is that it's no use if the last part of the song arrives first, or you have to wait half an hour for the middle chorus to turn up, or the last word in a sentence vanishes. It needs to all arrive in real time. After all, that is how it's being sung. So to make web casting work there needs to be something different, a new way of sending the packets. It needs to be fast and it needs to deal with lots more packets as video images carry a gigantic amount of data. The solution is to add something new to the Internet, called an overlay network. This sits on top of the normal wiring but behaves very differently.

The Internet turns rock and roll rebel

So the new real time transmission protocol gets a bit rock and roll, and stops being quite so polite. It takes the packets and throws them quickly onto the Internet. If the receiver catches them, fine. If it doesn't, then so what? The sender is too busy to check like in the old days. It has to keep up with the music! If the packets are kept small, an odd one lost won't be missed. This overlay network called the Mbone, lets people tune into the transmissions like a TV station. All these packages are being thrown around and if you want to you can join in and pick them up.

It's like someone sending a car bit by bit through the post... different bits can go by different routes

Crazy for you

The Madonna webcast was one of the first real tests of this new type of approach. She had millions of eager fans, but it was early days for the technology. Most people watching had slow dial-up modems rather than broadband. Also the number of computers making up the links in the Internet were small and of limited power. As more and more people tuned in to watch, more and more packets needed to be sent and more and more of the links started to clog up. Like dozens of cars all racing to get through a tunnel there were traffic jams. Packets that couldn't get through tried to find other routes to their destination … which also ended up blocked. If they did finally arrive they couldn't get through onto the viewers PC as the connection was slow, and if they did, very many were too late to be of any use. It was Internet gridlock.

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Who's that girl?

Viewers suffered as the pictures and sound cut in and out. Pictures froze then jumped. Packets arrived well after their use by date, meaning earlier images had been shown missing bits and looking fuzzy. You couldn't even recognise Madonna on stage. Some researchers found that packets had, for example, passed over seven different networks to reach a PC in a hotel just four miles away. The packets had taken the scenic route round the world, and arrived too late for the party. It wasn't only the Madonna fans who suffered. The broadcast made use of the underlying wiring of the Internet and it had filled up with millions of frantic Madonna packets. Anyone else trying to use the Internet at the time discovered that it had virtually ground to a halt and was useless. Madonna's fans had effectively crashed the Internet!

Webcasts in Vogue

Today's webcasts have moved on tremendously using the lessons learned from the early days of the Madonna Internet crash. Today video is very much a part of the Internet's day-to-day duties: the speed of the computer links of the Internet and their processing power has increased massively; more homes have broadband so the packets can get to your PC faster; satellite uplinks now allow the network to identify where the traffic jams are and route the data up and over them; extra links are put into the Internet to switch on at busy times; there are now techniques to unnoticeably compress videos down to small numbers of packets, and intelligent algorithms have been developed to reroute data effectively round blocks. We can also now combine the information flowing to the viewers with information coming back from them so allowing interactive webcasts. With the advent of digital television this service is now in our homes and not just on our PC's.

Living in a material world

It's because of thousands of scientists working on new and improved technology and software that we can now watch as the housemate's antics stream live from the Big Brother house, vote from our armchair for our favourite talent show contestant or 'press red' and listen to the director's commentary as we watch our favourite TV show. Like water and electricity the Internet is now an accepted part of our lives. However, as we come up with even more popular TV shows and concerts, strive to improve the quality of sound and pictures, more people upgrade to broadband and more and more video information floods the Internet … will the Internet Die another Day?