Name: _____ Date: _____

How a Cat Picture Gets to You

Reading level 11 (7th grade) · 843 words

Ravi taps a photo of a cat. A moment later the cat is on his screen, orange and cross, staring out of a window. It feels like nothing at all. But the photo is stored on a computer in a building a long way off, and it might even be across an ocean, far beyond anything Ravi can see. So how did the cat get to him? Let us follow one photo, step by step, and find out where all the pipes and wires go.

First, Ravi's tablet has to find the right computer. Websites have names that people can read, but computers find each other by numbers called addresses. A system called DNS works like a phone book for the internet. It turns the name Ravi tapped into the address of the computer that keeps the cat. That way, nobody has to remember the numbers. Now his tablet knows exactly where to send its question, so he taps, and the question is on its way.

Next, the question gets cut up. Anything sent over the internet is broken into small chunks called packets. Think of each packet as a very small letter, with the address written on the front and a piece of the message tucked inside. Ravi's question is tiny, so it fits in one packet. The photo that comes back is much bigger, and it will have to travel in a great many packets, one after another, and each packet gets its own number, so that it can be put in order later.

The packet leaves Ravi's tablet and finds its way to a router. A router is a device that passes packets along from one network to the next. It reads the address on each packet, and then it sends the packet on toward the next network on its journey. On the way, a packet meets many routers, and each one makes the same small choice: which way is next? A router is a little like a traffic officer at a busy crossing.

Sooner or later the packet reaches a coast, and there is an ocean to cross. So it goes into a submarine cable, which lies on the floor of the sea. Inside the cable are glass fibers, and the fibers carry light from one end to the other. Each fiber is about as thin as a human hair. Out in the deep ocean, the whole cable is about as wide as a garden hose, and it carries the question across to the other side.

How much of the world's data goes under the sea? Almost all the data that crosses an ocean goes under the sea, in cables. Satellites carry only a thin sliver of it. Most of it travels by glass, in cables, on the sea floor. That is a great deal of glass under a great deal of water. When you reach across the world, you are very likely reaching through a wire that is lying at the bottom of the ocean.

The computer that keeps the cat receives the question and answers it. The photo is split into many packets, and each one is sent back with Ravi's address on the front. Each packet is like one piece of a jigsaw puzzle, mailed in its own envelope. Here is the surprising part: the

packets do not have to travel together. The routers send each packet on its own, so the packets can take different roads, and some may arrive in a different order than they left.

That is not a problem, because the packets are numbered. When they reach Ravi's tablet, it uses the numbers to put them back in the right order, the way you would fix the pages of a book that had fallen on the floor. Then the whole picture appears at once: whiskers, window and one very cross orange cat. All of this has happened while Ravi was still holding out his finger, and the cat looks as if it has been there all along.

The idea of packets is fairly new. In the early 1960s, an engineer named Paul Baran worked on it at the RAND Corporation in the United States. In 1965, Donald Davies, working separately in Britain, came up with the same idea and gave it the name packet switching. Their work led to early networks that were the ancestors of the internet. Before their idea, a phone call held a whole line to itself. Packets let many people share the same wires at once.

Cables get damaged, too. When a cable breaks, a repair ship is sent out to the spot where it broke. Still, packets travel one at a time, so they can take another road in the meantime. The next time a cat appears on your screen, remember where it has been. It was cut into pieces, sent as light through glass, carried across the sea, and put back together just for you. It is a very long trip for a very small cat, and Ravi has already scrolled on to the next picture.

Questions

1. What does DNS do in this book?

A. It turns a name into an address
B. It makes the cat orange
C. It cuts the cable

2. What is a packet?

A. A small chunk of data
B. A kind of cat
C. A glass tube

3. Why can packets arrive out of order and still make the picture?

A. They are numbered, so the tablet can put them back
B. The cat shows up in any order
C. The pictures are printed

4. What do the glass fibers in a submarine cable carry?

A. Electric cars
B. Water
C. Light

5. What does a router do?

A. Plays music

B. Passes packets along to the next network

C. Draws the photo

6. Why does a broken cable not stop the cat picture for good?

A. Packets can take another road

B. The cat swims across

C. Ravi fixes it

Words to know

packet: data chunk

router: packet director

submarine: under the sea

fiber: thin glass thread

address: where to send

Answer key: How a Cat Picture Gets to You

1. A. It turns a name into an address
2. A. A small chunk of data
3. A. They are numbered, so the tablet can put them back
4. C. Light
5. B. Passes packets along to the next network
6. A. Packets can take another road