NAME _____

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WEB & WIRELESS TECH

Marian Croak

Packets, Patents, and the Rise of Internet Voice

How an Engineer Moved Voice Onto the Internet

Dr. Marian Croak, born in 1955, is an American engineer whose work helped move human communication onto the internet. She is widely recognized as a pioneer of Voice over Internet Protocol (VoIP), the technology that carries voice calls over internet connections rather than over the traditional telephone network.

Traditional phone systems set up a dedicated line between two callers for the length of a call. VoIP works differently: it converts the analog sound of a voice into digital data, breaks that data into small units called packets, and sends those packets across the internet to be reassembled into sound at the other end. Because the internet can route each packet along whatever path is available, this approach uses network capacity more flexibly than a dedicated line. The same underlying method now powers the video conferencing and internet calling applications that billions of people rely on.

Croak's contributions are reflected in her patents. She holds more than 200 patents, and roughly 135 of them relate to VoIP. A patent is a legal record that identifies a person as the inventor of a new idea or method. Beyond voice technology, she invented 'text-to-donate,' a system that lets people contribute to a charity by sending a text message to a short code. It was used widely to raise relief funds after disasters, including Hurricane Katrina in 2005 and the 2010 earthquake in Haiti.

Croak spent decades at AT&T, where much of her VoIP work took place, before joining Google as a Vice President of Engineering. At Google she has led teams working on major challenges, including a group focused on Responsible AI, which examines how artificial intelligence systems can be built and used ethically.

In 2022, Croak was inducted into the National Inventors Hall of Fame, becoming one of the few Black women to receive that recognition. Her career demonstrates how a single engineer's inventions, from internet calling to text-based giving, can reshape both everyday communication and the way communities respond to crises.

Part 1 · Comprehension & Analysis

1. Contrast how a traditional telephone call and a VoIP call move information between two people.

2. According to the passage, why is packet-based routing described as more flexible than a dedicated line?

3. What does the number of VoIP-related patents (about 135 of more than 200) suggest about the focus of Croak's inventive work?

4. How does the passage connect Croak's inventions to helping communities during crises?

Part 2 · Quantitative Challenge

VoIP Data Usage Over a Call

A VoIP call sends voice as a stream of data packets. Suppose a call sends voice data at a rate of 64 kilobits per second (kbps). Remember that 8 bits equal 1 byte, and treat 1,000 kilobytes as 1 megabyte.

1. How many kilobits of voice data are sent in one minute? (64 kbps × 60 seconds)

2. How many kilobits are sent over a 10-minute call? (3,840 × 10)

3. Convert that to kilobytes by dividing by 8. (38,400 ÷ 8)

4. Convert that to megabytes by dividing by 1,000. (4,800 ÷ 1,000)

Part 3 · Discussion & Extension

Croak's inventions made communication and charitable giving faster and more accessible, and she now leads work on Responsible AI. Write an argument evaluating whether engineers who create powerful communication technologies also bear responsibility for how those technologies are used. Support your position with reasoning and specific examples.