How Computers Store and Play Back Sound

KS3 COMPUTING Ages 11-14 ⏰ 3 min read

What Is Sound, Really?

Sound is made of invisible waves that travel through the air. When someone speaks or a drum is hit, it creates vibrations that move outward like ripples in water. Your ear catches these waves and turns them into signals your brain understands as noise, music, or voice.

But computers don't have ears like you do. So how do they catch, store, and replay sound? The answer is surprisingly clever!

Think of it like taking a photo of a moving sunset. A camera captures one instant in time. A computer does something similar with sound, but instead of taking one picture, it takes thousands of tiny snapshots of the sound wave every single second.

Recording Sound: Turning Waves into Numbers

When you record sound on a computer using a **microphone**, something amazing happens. The microphone vibrates at the same frequency as the sound waves hitting it. Those vibrations are then sent to a device called an **analog-to-digital converter (ADC)**.

The ADC does the real magic: it measures the strength of the sound wave thousands of times per second and turns each measurement into a **number**. This process is called **sampling**. A CD-quality recording samples sound **44,100 times every second**! Each tiny number is represented as **binary code** — just **0s and 1s** — which computers love.

Think of it like describing a roller coaster to a friend using only heights. You could measure the height every metre along the track: 10 metres, 15 metres, 8 metres, and so on. If you know all these heights, you could almost rebuild the roller coaster's shape. Sampling does the same thing with sound waves.

Storing the Sound

Once sound is converted to numbers, it's stored as a file on your computer's **hard drive** or **solid-state drive**. Common file formats include **MP3**, **WAV**, and **FLAC**. These are just different ways of organizing and compressing (making smaller) the sound data so it doesn't take up too much space.

Playing It Back

When you press play, the computer reads those stored numbers and sends them to a **digital-to-analog converter (DAC)**. This device does the opposite of what the ADC did: it takes the numbers and converts them back into electrical signals that make your **speaker** vibrate. Those vibrations create sound waves, and you hear your music, voice message, or video!

The entire process happens so fast that it feels instant — but it's really just millions of 0s and 1s being read, converted, and turned back into the sound waves you recognize.

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