Musicians dream of a faster Internet, for a coast-to-coast jam in real time

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Chris Chafe, director of the Center for Computer Research in Music and Acoustics at Stanford University, hooks up to a group of musicians at Virginia Tech. He's in the center's studio in The Knoll, a building on the university's campus in Stanford, California, Nov. 17, 2014. Nhat V. Meyer/Bay Area News Group/TNS

SAN JOSE, Calif. — The Internet is already incredibly fast. It's so fast that the San Francisco Bay Area can connect with New York City quicker than you can finish this sentence.

That's a blistering speed — but not quite fast enough for musicians, who dream of a day when notes travel at the speed of light. If that were possible, then the entire globe could play together in a single orchestra, via the Internet.

Right now, problems arise when musicians in distant locations attempt to perform together.

30 Milliseconds? "An Eternity"

"The delays are devastating," said sound engineer Elizabeth Cohen. "Thirty milliseconds? That's an echo — an eternity."

Music is "shared communication" — and a kind of communication that depends on immediate feedback, said Cohen.

So hopes are pinned on an attempt to make computers so much faster that they approach light speed. Light travels at about 186,000 miles per second, the fastest anything in the universe can go.

The new effort was launched in October by a team led by computer research scientist Brighten Godfrey.

Their mission has been named “Networking at the Speed of Light.” It challenges scientists to create an Internet with speeds as fast as physically possible. They imagine instant-messaging chats that don’t oddly slow down, and cat videos that don’t stop, start, lag, then freeze.

They also imagine musicians in Hawaii and Antarctica being able to perform a seamless Beethoven quartet together.

Too Slow To Jam

The problem now is the time delay that occurs when a signal travels across a computer network — a group of computers that are linked together. A computer signal contains coded information that is seen or heard on the other end as text, image or sound.

Signals travel the Internet about 10 times slower than the speed of light — often 100 times slower.

On a typical computer network, a San Francisco–New York connection takes about one second, even longer. If traveling at the speed of light, it would take just 27 milliseconds — a millisecond being one-thousandth of a second.

The relative crawl frustrates musicians. Right now, networked musicians in the same town can jam together online, but it’s far tougher if great distances separate them.

Delays are a big problem for Internet companies, as well, as slow speeds can lead to millions of dollars in lost revenue.

The speed-of-light campaign “represents a significant contribution to our understanding of what causes poor performance on the Internet,” said Google's Maggie Johnson. “We’d like to minimize the delay between our services and our users.”

A Long-Distance Concert

Technology is already changing the way music is made — for example, lessons and auditions are now being held via YouTube. Composer Eric Whitacre’s “Virtual Choir” mixed 2,052 voices from around the world onto one track.

However, real-time collaboration remains the final frontier. “A faster Internet could allow me to receive better audio that I could monitor in my control room," said Joe Weed, a Los Gatos-based producer, engineer and musician. With faster speeds Weed could "make decisions about even subtle musical elements, including fine tonal or spatial differences,” he said.

A recent performance at Stanford showed the promise of using Internet speed to build cultural bridges through music.

The concert featured 13 musicians in different locations, all linked together by Stanford scientist-musician Chris Chafe and the university’s high-speed Internet connection. The various players were at Stanford, UC Santa Barbara, Virginia Tech and Mexico’s University of Guanajuato.

"Imagining The Universe"

Hearing each other as if playing in the same concert hall, they wove together a textured tapestry of music. The performance, called “Imagining the Universe,” blended classical, folk and electronic music.

Microphones sent music through a desktop computer, which put the audio onto the network. The sounds zipped through the network to distant computers and then into loudspeakers.

It took 46 milliseconds for Virginia Tech’s bass and piano notes to land at Stanford, and another 46 milliseconds for Chafe’s cello to be heard in Virginia. Speeds were similar for Mexico’s lilting flute. Santa Barbara, closer, was only 7 milliseconds away.

The high-tech event had its glitches. Explosive sounds punctuated the performance, startling the audience and causing a musician to leap from his seat to crank down the volume.

"Beyond Where We Are"

Still, the show seemed miraculous, and the crowd applauded appreciatively.

The performance was possible only because Stanford’s Internet connection is fast enough — and the music slow enough, said Chafe. “If we were to play a locked rhythm together, we would not have as easy a time.”

The first mission of the challenge is to find what causes delays. Factors at every layer of the Internet will be measured.

“We couldn’t have dreamed, 30 years ago, that we’d be where we are,” said Godfrey. “Now we are trying go beyond where we are, to truly bring the whole world together.”