NTT Com and Pandora perform in harmony for a demanding audience

Streaming audio to millions of users takes a fast, reliable network; 10G Ethernet service from NTT Communications helps the Internet radio station Pandora keep its listeners humming.

Internet radio station Pandora has a demanding audience, some 20 million strong. When listeners visit www.pandora.com or download the Pandora application to their mobile phone, they primarily want one thing – to hear music they like. To ensure its audience is never disappointed, Pandora has to be similarly demanding of the carriers that provide it with Internet bandwidth.

And demanding it is. The network over which Pandora delivers its radio service is a model of performance and reliability, with redundant 10G Ethernet connections to a pair of carriers. Pandora insists its carriers deliver Internet connections with diverse routes to protect itself in case of a circuit outage. It even has specific router requirements for its chosen providers.

"The central charge we have is the quality of the listening experience for all of our listeners," says Steve Ginsberg, Director of Technical Operations for Pandora. "While price is an important part of how we choose a carrier, the more important part is that we maintain that listener experience."

NTT America, the U.S. owned subsidiary of NTT Communications (NTT Com), fit the bill for Pandora on all counts, providing a 10G Ethernet service that is "steady and reliable," Ginsberg says.

Music in its genes

Pandora launched its Internet radio service in 2005, but the work that went into it dates back to the Music Genome Project that began in 2000. Billed as the most comprehensive analysis of music ever, the project involves a team of 50 musicians who listen to thousands of songs and recorded details about their melody, harmony, instrumentation, rhythm, vocals, lyrics and more – as many as 400 distinct musical characteristics per song.

The typical music analyst involved in the project has a four-year degree in music theory, composition or performance, and must pass a selective screening process and intensive training. The result of their work is an extensive database of characteristics on nearly 100 years' worth of music – with more being added all the time.

That database is at the heart of the Pandora experience. When listeners go to the Pandora site, they are directed first to a server cluster that runs the music database. They type in the name of a favorite song or artist and Pandora quickly searches its database

Highly skilled music analysts continually add songs to the Pandora database.

to find songs with similar musical characteristics. It then hands off the songs, in the form of URLs, to a collection of media servers that stream the songs one after another to the listener over 10G bps Internet connections, providing information on the songs and artists along the way.

Pandora launched its Internet radio service using just a handful of servers and a 100M bps Internet connection. "It scaled up quickly," Ginsberg says. "Within six months, we were adding a single gigabit line every month. From there, we scaled up to 10G providers, and that's when NTT Com entered the picture."

The NTT Com sales team "did a good job understanding what our requirements were and provided offerings that enabled us to do what we needed to do," he says, adding that the company also delivered a good, timely turn-up of the service.

"But the first and most important

At Pandora.com, listeners type in the name of an artist or song they like to create a "station" that plays songs similar to their selection.

criterion is that a 10G provider be able to bring an excellent experience to all of our listeners. That can only be done by providers that have excellent technical staff and excellent infrastructure with enough capacity," Ginsberg says. "Being able to deliver a diverse path to the Internet is something we put a strong premium on as well – that's all about meeting service level agreements and providing fault tolerance."

Pandora's media servers provide data on how long it takes to deliver audio to each end user, which means Ginsberg's team can assess the performance of each of its carriers. "That's one way we know that NTT Com has excellent performance," he says. "Generally,

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On the few occasions where Pandora has had to address an issue in the NTT Com network, engineers were able to call directly into the NTT Com network operations center (NOC) to quickly

resolve the issue or get questions answered by a certified network engineer. "We certainly like that we can call directly into the NOC," Ginsberg says. "NTT Com has been responsive, and we've really been satisfied with the quality of their answers."

Pandora has been equally pleased with the way NTT Com handles routine maintenance on its network, both in terms of communicating planned maintenance windows and performing the work on schedule, he says.

NTT also played a role in helping Pandora deploy the Border Gateway Protocol (BGP), which is the core routing protocol on the Internet. BGP provides additional redundancy and load balancing for Pandora by giving it more granular control of traffic flows. For

example, if a large number of Pandora users are served by the same ISP, they can be divided onto separate 10G links provided by different carriers.

"NTT Com has certainly been helpful in establishing the BGP configuration we're using," Ginsberg says.

The bottom line for Pandora is simple: "What we need is consistency in terms of throughput and bandwidth availability. That's the main thing," he says. "NTT Com's service has been steady and reliable."

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