Q&A: Cloud Computing for Engineers

National Instruments Vice President of Product Marketing for Software John Pasquarette discusses cloud computing and outlines the key benefits of cloud computing for engineers.

Q: What is cloud computing?

Cloud computing is a new generation of computing that uses distant servers to provide services and storage accessed over the Internet (or "cloud"), often on a consumption-based model. Typical cloud computing providers like Microsoft, Salesforce.com, IBM, Amazon and Google deliver applications online that are accessed from a Web browser while user data is stored on remote servers. In cloud computing, those servers are usually owned and maintained by a third-party provider on a consolidated basis in a remote data center.

Many engineers and scientists may already use cloud computing outside their professional careers. Prominent companies such as Microsoft, Google and others provide free online services like e-mail, word processing, photo sharing and movie publishing. Users interact with software runs inside any Web browser at any time and access data stored remotely on servers in data centers whose locations are not possible to discern.

Q: What are the benefits of cloud computing for engineers?

The rise in popularity of cloud computing is due to the desire to outsource the maintenance burden of server hardware and software, the need to make capital investments to scale systems up or down on demand and the convenience of being able to access data from anywhere with an Internet connection. Productivity gains for engineers and scientists will likely be seen from the cloud in the next few years in the areas of:

1) Data aggregation
2) Computing power
3) Ability to access anywhere

Because the cloud is simply interconnected computer networks housed in large data centers all over the world, one key benefit is the scalability of resources. Using the cloud, users are not confined by the amount of on-site server space they have at their facilities. As data is collected and calculated, it can be stored in the cloud along with other data sets. As the amount of data increases, additional space in the cloud is provisioned accordingly.

This scalability of resources also applies to computing power. The amount of data collected by engineers is growing while the computations they perform are becoming more complex. Advanced analysis over large data sets can be distributed across multiple high-power server machines using cloud technology, which frees local resources.

Additionally, the cloud allows engineers to access applications and data from anywhere using a Web browser. Users can be collecting data deep in the rain forest but viewing the data thousands of miles away on a mobile device.

Q: How is National Instruments applying cloud resources to engineering and scientific problems?

NI is known for being at the forefront of new technology trends, and while cloud computing isn't poised to be a mainstream technology for most engineers and scientists, NI has identified several areas where it can be applied today. One initial area where NI has applied cloud technology is compiling embedded field-programmable gate array (FPGA) code. FPGAs are reprogrammable silicon chips that are massively parallel, with each independent processing task assigned to a dedicated section of the chip. Increasingly, engineers without FPGA expertise want to use NI LabVIEW FPGA and NI FPGA-based custom hardware for unique timing and triggering routines, ultrahigh-speed control, interfacing to digital protocols, digital signal processing (DSP), RF and communications and many other applications requiring high-speed hardware reliability customization and tight determinism.

However, compiling FPGA code is an extremely long and resource-intensive process that can take hours or days to complete. To alleviate the need to dedicate a development machine to compiling FPGA code, NI is working to help LabVIEW users offload FPGA compiling to the cloud; in this process, LabVIEW users can seamlessly use powerful, dedicated remote computers to compile their LabVIEW FPGA code, freeing their development machines to be used for other purposes.

Another area NI is researching is cloud storage of technical data. No matter what the industry, NI customers tend to produce extreme amounts of data as part of their test, measurement or automation applications. That data is critically important to the engineers involved, but storing large amounts of data is often challenging because it requires time, energy and capital spent setting up databases or other organization solutions. NI is investigating how to place cloud storage capabilities in the hands of engineers and scientists so they can store their engineering or scientific data in the cloud and retrieve it later from any location.

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