NeCTAR Uses OpenStack

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Building a Cloud for National Collaborative Research

The Australian government is funding a cloud that is making it simple for researchers across disciplines to access IT resources, collaborate, and share their findings.

Through a series of “town hall” meetings in 2010, the Australian research community voiced their need for a flexible, low cost computing resource that they could access on demand. A cloud solution quickly became the sought after approach, with its low barriers to entry well matched for the collaborative nature of academic research.

“The idea was that the good ideas can be shared early, because of the on-demand and scalable nature of the cloud. If they’re successful, they can scale easily,” says Associate Professor Glenn Moloney, Director of the National eResearch Collaboration Tools and Resources project (NeCTAR).

Building on a solid foundation of government investments in High Performance Computing, a high bandwidth national network (AARNet) and data initiatives such as the Research Data Storage Infrastructure (RDSI) and Australian National Data Service (ANDS), the research cloud provides an opportunity to invest at scale to support highly diverse research computing needs. “It liberates the applications and data by providing a place for hosting and makes it more available to wider communities,” continues Moloney.

Tom Fifield, Cloud Architect at NeCTAR also noted the impact of the increased flexibility, “For example, researchers can’t host a Web service on an HPC system. And our researchers have many use cases where their groups just want to be able to deploy some kind of collaborative tool online, such as a wiki, or a blog.”

To provide researchers throughout the country easier access to computing resources, the University of Melbourne was commissioned by Australia's Department of Industry, Innovation, Science, Research and Tertiary Education (DIISRTE) to initiate a cloud that would be used for national research. That cloud was named the NeCTAR Research Cloud, and went live on January 31, 2012. Three additional sites have been selected at the Australian National University, Monash University and the Queensland Cyber Infrastructure Foundation (QCIF) to deliver additional capacity in a federated single national cloud. Further sites will be deployed in 2013.

Today, NeCTAR enables Australian researchers to easily put their ideas, tools, research applications and data online. The new cloud capabilities have equipped researchers with the ability to easily share and manipulate their data, and publish it to other researchers anywhere around the world. For massive storage capabilities, NeCTAR partners with the Research Data Storage Initiative, and for research data sharing the Australian National Data Service. Finally, to help ease and centralize access and authentication, the Australian Access Federation provides national single sign-on services for NeCTAR.

However, before the cloud was to be built, NeCTAR had considerable research of its own in order to determine the best platform in which to build their cloud.

Selecting a private cloud platform

To gain that understanding, the project brought many of the sector's technical experts together for a large cloud workshop.

In addition to potential cost savings of running their own infrastructure, the infrastructure would be run by teams who understood researchers and would be able to customize the cloud environment in ways that public providers just couldn't. In their effort, a technical working group evaluated most of the open source cloud platforms available in early 2011. However, only one appeared as if it could fully meet the needs of the NeCTAR research cloud.

In August 2011, the University of Melbourne began piloting OpenStack in earnest with about 300 cores. By November that year they had decided to move forward with a full-scale OpenStack deployment and they purchased an additional 3,840 cores. "At that time, we dedicated all of our resources to getting the OpenStack production cloud live," Fifield says. ""We were quickly able to stand up the first install of the NeCTAR research cloud at the University of Melbourne on January 31, 2012, running fully on OpenStack," he says.

The team appreciated the openness of OpenStack, with its development culture fitting well with the research ethos, in addition to the needs of the project.

"OpenStack seemed to have this active community that a lot of the other platforms didn't have," said Fifield "Since then we've really seen the community come into play--we're getting great answers to our questions and the development direction is going exactly where we need it to go."

Increasingly, more research organizations and businesses are choosing OpenStack, including the San Diego Supercomputer Center, the Argonne national Laboratory, U.S. Department of Energy, NASA, University of Bedfordshire, Purdue University, and others. Created to drive industry standards, end cloud lock-in and speed cloud adoption, OpenStack is a common, open platform for both public and private clouds with the support of over 180 technology leaders, more than 3,600 global project participants and 200,000+ downloads. The open source cloud operating system controls pools of compute, storage and networking resources throughout a datacenter.

Two key things the University of Melbourne appreciated about OpenStack were the ability to automate maintenance routines and how easily users can provision their own resources, such as servers and storage. "We spent a lot of time making sure we could automate the cloud, because we were so people power poor. The time we spent setting up Puppet and Groundwork (a Nagios monitoring framework) was important, so the cloud could more or less run itself when online," he says.

The cloud currently runs on Ubuntu 12.04 LTS, and is 95% Essex release, 5% backport and other patches.

Researchers quick to embrace NeCTAR Cloud

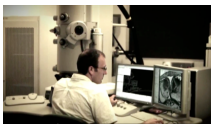
Today, through the availability of the NeCTAR research cloud, Australian researchers can move their research to the cloud by simply visiting the NeCTAR online dashboard and logging in with their existing institution supplied username or password.

"Our OpenStack Cloud has been running phenomenally well. We've had a lot of fantastic feedback," says Fifield. Within weeks the NeCTAR cloud was put to use by 27 universities and about 15 other research institutes around the country, including the Commonwealth Science and Industrial Research Organization and the Australian Institute of Marine Science. "The success has been beyond our expectations, considering we haven't done much yet to get the word out about the cloud," Fifield says. As of August, 2012, over 1100 researchers from all parts of Australia have logged in to the NeCTAR Research Cloud – and more join every day.

While University of Melbourne is well underway in the development of its site of the national cloud, there is still much more to be done. Currently NeCTAR is getting set to deliver three more cloud sites similar to the 4,000 cores at the University of Melbourne. "That's going to take us to about 16,000 cores by the end of the year, and we plan to expand the cloud to about 25,000 cores by the end of next year," he says.

"What's going to be fascinating is watching the opportunities unfold as this cloud grows in size and its adoption. It will be exciting to see all 55,000 research staff be able to login to a website and click a few buttons to access vast data sets in their disciplines and start to work on that data right away," he says.

NeCTAR is an Australian Government project conducted as part of the Super Science initiative and financed by the Education Investment Fund. The University of Melbourne has been appointed the lead agent by the Commonwealth of Australia, Department of Industry, Innovation, Science, Research and Tertiary Education.



NeCTAR

http://nectar.org.au/
Industry: Academic / Research
Headquarters: Melbourne
Size: More than 10,000 employees

OpenStack technologies NeCTAR uses:

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Links About NeCTAR

- Interview with NeCTAR Team (http://www.youtube.com/watch?v=8L5_NsHdgWo&feature=youtu.be)
- NeCTAR at the Boston OpenStack Summit (http://nectar.org.au/news/nectar-travels-us-collaborate-cloud-technology)
- NeCTAR Presentation at the San Francisco OpenStack Summit (http://www.slideshare.net/laurabeckcahoon/nectar-openstack-2012-v3)