LINC: A Pure OpenFlow Software Switch

A FlowFowarding.org production, for practitioners marching towards Software Defined Networks

Software has unlimited potential when coupled with generally available, inexpensive, programmable hardware. The FlowFowarding community is focused on helping all consumers of networking technology realize the full potential of software defined networking by developing Open Source implementations of OpenFlow and related standards under Apache 2 license. The first result of this effort is LINC, an ONF's OpenFlow version 1.2/1.3.1 compliant Capable Switch with support for OF-Config 1.1 Standard towards management of the same.

LINC was developed using Erlang programming language, which was designed to build massively scalable, highly availably, real-time systems, such as those in telecoms, banking, e-commerce, computer telephony and instant messaging. Erlang's runtime system has built-in support for concurrency, distribution, fault tolerance and ability to hot patch a fix without rebooting.

LINC is architected to use generally-available commodity x86 hardware and runs on a variety of platforms such as Linux, Solaris, Windows, MacOS, and FreeBSD where Erlang runtime is available. LINC, today, has been successfully tested on various flavors of Linux ranging from kernel versions of 2.6 to 3.4. The benefit of the x86-based platform is that LINC can take advantage of availability of lots of CPU cores and memory and scale gracefully to increase and decrease of compute resources. This is critical when many logical switches are instantiated on a single OpenFlow Capable Switch. These logical switches can have varied resource allocations based on need.

While performance can be improved by use of kernel modules, the focus of LINC and the community is to truly understand the value of OpenFlow based networking. LINC itself can be deployed on current traditional networks seamlessly in a Overlay Network paradigm thus providing customers the benefit of inexpensively deploying a SDN network and moving only those applications underneath this network so that they can truly derive the value of OpenFlow and SDN.

Most recently, LINC has been applied to solve a major challenge in today's IT: over provisioning and better utilization of deployed resources. With increasing complexity in networks due to forces such as cloud, virtualization and big data, network scaling is still ineffective even with over provisioning. In an experimental setup to accelerate Big Data application such as Apache Hadoop, the networking paradigm was changed to use LINC OpenFlow Switch and results were very encouraging with a substantial performance gain. This model not only increased performance, but also used traditional Ethernet and hence facilitated easy repurposing of resources for other jobs when big data is not being processed.

LINC source code and documentation, including published research papers on the LINC OpenFlow Switch for Apache Hadoop, is available at http://www.FlowForwarding.org. LINC and the work FlowForwarding.org is doing are getting us one step closer to realizing the full potential of SDN today.

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