Software Defined Infrastructure / Software Defined Exchange Workshop

SDN Infrastructure Ecosystem

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For the last several years, Internet2 has been providing a US national-scale Research and Education (R&E) network infrastructure that supports deep programmability using OpenFlow. The lessons learned in managing this unique SDN capability are helping Internet2 evolve the current infrastructure and inform our investment strategy as we move towards a major refresh of the backbone infrastructure in 2018. Based on that experience, we see a few key features that are vital for the next iteration of software defined research infrastructure:

Agility - A future platform for innovation in the Software Defined Infrastructure (SDI) space will require greater agility for the researcher: as new ideas are tried and refined the infrastructure must allow for spiral or other iterative development processes. The platform must be thought of as part of a continuum with production services that are vital to support discipline science with high capacity, reliable services. Ideas proven to be useful and effective should have a streamlined path into production products. The challenge is to do so without creating dependencies on mainline vendor products whose feature sets are driven by considerations other than research needs. Developing R&D partnerships with vendors working in this space is key.

Process - The evolution of the SDI/SDX infrastructure will require processes that encourage and enforce a greater level of development discipline than is typical for code produced by academia. Rigorous unit and system testing should occur prior to large-scale deployment. This will avoid disruptive outages and encourage deployed services that can be operationalized more efficiently. A key goal should be to move away from the "demo" mindset common in this community, towards a "showcase" focus for services that are moving towards fully operational status and serving real users.

Scope - Science today is collaborative and global. The next platform to support innovation needs to be driven by a systems view that encompasses campuses, regional networks, and international partners. Interconnection points and international circuits require common, flexible policy regimes. Infrastructure investments that carry restrictive terms of use should be avoided. Cooperation should be encouraged, and there should be ample capacity provisioned as a "commons" for general use. Comprehensive identity management should be employed that grants appropriate access to virtualized network functions and other higher-level services. Robust governance that can take the systems view and effectively operate internationally will be key.

Services - Experimentation in virtualized network functions will require the research infrastructure to provide some native distributed storage and compute capability, while also allowing for researchers to deploy custom hardware when needed. The platform should make both co-location and NFV options easily available in a professionally managed, cost effective manner.

The author has been in the R&E networking community since 2000, and has held technical and leadership positions at the campus, regional network and national network levels. During that time he has focused on strategy & service development, technology evaluation, and research support.