# Application for Participation in Software Defined Infrastructure / Software Defined Exchange Workshop

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## Research Directions

I believe one of they key considerations for any future network infrastructure architecture and technology is economics. The Internet is so successful and ubiquitously deployed because network providers have economic incentives to operate (either through payments from customers or through government support). Currently, these economic exchanges occur at very coarse time scales (months or years) and at very coarse network scales (entire links or prefix aggregates). With Software Defined Networking (SDN) technology, much finer-grained control of the network is possible. With this finer-grained control, it is also possible to envision networks, where economic agreements occur at finer time scales and finer network scales (in the limit for individual end-to-end connections).

The relevant research questions that would be interesting for this workshop are: (1) *What mechanisms are necessary in the control plane to set up higher-layer economic agreements at Software Defined Exchanges that span multiple providers?* (2) *What primitives (e.g., access control, measurement, QoS) does the data plane of a Software Defined Infrastructure need to provide to enable and enforce economic agreements?* (3) *How can Software Defined Exchanges not only interconnect paths, but also provide Network Function Virtualization (NFV) across multiple providers?* (4) *How can trust and verification mechanisms be established that provide assurance that traffic followed a agreed-upon, paid-for path and, more importantly, what virtual network functions have been executed on that traffic?*

These questions are also important in the context of Software Defined Infrastructur testbed. While economics play a minor role in shared community infrastructure, they become important when considering transition paths to production networks.

## My Background

I am Professor of Electrical and Computer Engineering and Associate Dean of Engineering at the University of Massachusetts Amherst. Over the past 15 years, I have engaged in research and teaching in the areas of computer networks, computer architecture, and embedded systems. My specific research interests include Internet architecture, network routers, and embedded system security. I was lead principal investigator on the ChoiceNet project, one of five large NSF Future Internet Architecture (FIA) projects.

In ChoiceNet, I and my collaborators have explored the development of an "economy plane" for the Internet, where providers can offer services and end-users (or their applications) can select, pay for, and use these services. In our prototype implementation, we were able to show these interactions all the way from a PayPal transaction down to setting up forwarding rules in SDN switches for the purchased service. More recently, we have expanded the idea of integrating economics into the network architecture by exploring how to use economic exchanges to implement policies within software-defined exchange points (SDXs).