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Topics of Most Interest:

1. Network Support for the cloud,
2. Cloud Interoperability and Standardization,
3. Cloud Security, Privacy and Auditing

Summary of our Current Research Related to Clouds:

Scientific applications, on consolidated resources ranging from private clouds within universities and research organizations, science clouds consisting of various grid resources such as supercomputing centers etc, and commercial clouds such as Amazon, GoGrid, Rackspace, etc, represent a highly distributed application context that can hugely benefit from considerable diversification of the underlying network substrate.

The next generation Internet should allow multiple packet switching network contexts to co-exist over a shared substrate. Each context is allowed to independently optimize its specific context without adversely affecting the performance of other co-located network contexts. To that end, we propose "elastic pipes," a dynamic, on-demand, end-to-end, infrastructure provisioning layer for the Internet. Elastic pipes borrow themselves from elastic clouds, an on demand, dynamic, compute resource leasing architecture popularized by various cloud computing platforms.

We are funded by NSF to develop a proof-of-concept implementation of our new object oriented Internet architecture. This implementation is expected to result in a thorough feasibility study of the basic principles behind our architectural ideas for the next generation Internet.

openSDN - A Service Delivery Network Architecture for Cloud Based Services

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The key trend driving the growth of Internet over the last decade is the **profusion of services** over the Internet. Google, Facebook, YouTube and similar services form the bulk of the Internet traffic. Cloud computing and proliferation of mobile devices has lead to further growth in services over the Internet. The current Internet architecture designed for point-to-point communication is not suitable for service delivery since most services are **distributed** and have multiple points of attachment. Many application service providers, therefore, bypass the Internet either by implementing their own WANs (e.g., Google WAN) or by leasing services from other private WANs (e.g., Akamai).

We would like to develop an open and secure service delivery network (SDN) architecture. openSDN will allow telecommunication carriers to offer SDN services that can be used by many application service providers (ASPs). For example, an ASP wanting to use multiple cloud computing centers could use it to setup their own world-wide application specific SDN and customize it by a rule based delegation mechanism. These rules will allow ASPs to share a SDN and achieve the features required for widely distributed services, such as, load balancing, fault tolerance, replication, multihoming, mobility, and strong security that are customized for their application.

The proposed research if funded will transform the Internet and its applications. It would make significant contribution towards developing a set of generic architectural primitives that may be used for developing application specific networks on shared network infrastructure. The societal impact of a secure Internet that allows proliferation of services, cloud computing, and millions of mobile devices is enormous. Clouds make computing a service. openSDN introduces the concept of *networking as a service* and will allow setting up new services using these clouds as easily as the clouds themselves. In addition to the shared SDNs, the architecture can also be used for private WANs, datacenter networks, new telecom services, scientific computing, and defense networks.