Networking Session1 Report

Networking Requirements for NSF Cloud Project

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Overview of Requirements

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- **Lightning Talks:** Almost all of these presentations referenced requirements for networking, including architecture, programmable networking (SDN etc), measurements, mobility etc. Note that many discussed capabilities for supporting large scale data intensive science applications.
- **Federation between Chameleon and CloudLab** to allow users to take advantage of resources at multiple sites.
  - Will this be possible in the near future?
  - Also possible federation with other mobile and wireless testbeds?
- **Identify enabling applications with specific networking requirements**- Examples discussed were CPS, such as power grid, radio telescopes, sensors, instruments.
  - Common theme is to identify the networking requirements to connect instruments to the NSF Cloud. Identify computation requirements and bandwidth reservation.

Requirements Cont

- **Personalized Networking** – The goal is to provide applications the ability to customize network to their own needs. The users may want to tweak network settings directly or provide requirements and settings would be tweaked for them. Could libraries be developed for this area?

- **Networking Adaptable to Apps** – Less manual adjustment at the edges – shift of automatic configs to network (e.g., for digital media)

- **Capability of NSF Cloud to handle User Intensive applications**– Identify network requirements to support applications with very large user bases. What would be the constraints when the applications have 100s of thousands of users (millions)? How would the experimenter know the ability of the underlying computation and networking resources to support the large user base? Is it possible to identify common networking requirements for suite of applications. How many applications with heterogeneous requirements can a single switch handle?

- **OpenFlow 1.3**
  - Is OpenFlow 1.3 supported on all switches?

Requirement cont.

- **Wireless, Mobility, and NSF Cloud** – Mobility is a major research topic. Wireless applications have requirements include the ability of aggregrating different wireless links, latency bounds and synergy between SDR and SDN. Understanding of implications of wireless network delay and computation delay

- **Network Instrumentation** – The NSF Cloud interface should support deep measurements of networking experiments. Need for tracing, recording and especially <u>repeatability</u> of experiments (Real science experiments can be replicated). Sufficient granularity not provided by public clouds. Hopefully, the NSF Cloud can provide different levels of granularity as required by different experiments.

- **Public Cloud Services on NSF Cloud** – Access to load balancers and security services available on AWS on NSF Cloud. At the same time, having low level access to switches, which can allow changing OS and switching OpenFlow versions should be possible.

- **Accessibility to Large User Base** – Ability to provide access to an online service on NSF Cloud to 100s of thousands of users to use the service. City Scale, e.g., US Ignite cities, etc.

- **Quick & Easy Access** – Providing easy to use on-ramps, e.g., via templates, is required

- **Benchmarking** – No benchmarking standards exist – should there be such standards