An Inter-domain SDN Traffic Engineering Mechanism for Scientific Data Transmission

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• Conclusions and Future Work

Inter-domain SDN: Motivations

Why SDN?
• Software defined networking (SDN) is one of the hottest research topics in networking area
• Openness
  – decouples the tightly coupled network architecture, and opens up the control plane and the associated protocol
• Agility
  – SDN enables more flexible network control and management
  – SDN promotes the rapid innovation on networking technologies by programing the network
• SDN is considered as a promising way to enhance the networks.

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How to extend SDN to the Global Scale

SIGCOMM13 demo
SIGCOMM14
INFOCOM14 demo
IEEE ComMag, Feb. 2015
Future
**Inter-domain SDN: Mechanism - WE-Bridge**

**SDN Architecture**

**West-East Bridge for SDN Peering**
- Each NOS gathers local network view, then exchange domain view among heterogeneous NOSes by WE-Bridge
- Inter-domain programming
  - APP requires the domain view information by WE-Bridge NB-API
  - APP Negotiates programmable resource (e.g. forwarding table) in another domain

**Domain View Abstraction: Virtualization**

**WE-Bridge Implementation**
- Enable WE-Bridge in all kinds of NOSes by adding three modules:
  - Network Virtualization, East-West Bridge, and LLDP Extension
Inter-domain SDN Testbed and Applications (with a demo)
Today’s demo

- How Inter-domain SDN Traffic Engineering Mechanism helps Scientific Data Transmission
- We can flexibly program the inter-domain routing/forwarding:
  - To enable fine granularity inter-domain differ-serv
  - for VIP traffic identified by any IP source/destination address, or by TCP/UDP source/destination port
  - for flexible traffic policies (delay, bandwidth, packet loss rate, etc.)
- We demo and validate how to serve for important inter-domain scientific data transmission when packet loss or link failure happens

Conclusions and Future Work

- To scale SDN to the global level, we need distributed inter-domain SDN
- WE-Bridge is the very first distributed and automatic (East-west Boundary APIs) Inter-domain SDN mechanism
  - Distributed domain views exchange
  - NB-APIs provided to APPs to flexibly program the inter-domain routing/forwarding
- CANS FIWG deployed the very first inter-domain SDN testbed
  - Among SDN domains in CERNET (Tsinghua, BUPT), INTERNET2, CSTNET, SURFnet, and APAN-Japan
- Multiple inter-domain application have been deployed

Future work

- Plan to extend the inter-domain SDN network
  - The inter-domain SDN mechanism and software are planned to be deployed at Internet2 SDN backbone (so far the technical documents and test report have been reviewed and preliminarily approved)
  - Some universities in China showed interests to join
  - Call for more partners!
- More APPs and use cases
- CANS FIWG next demonstrations at CANS2016!
Thanks!