A Software Defined Approach to Unified IPv6 Transition

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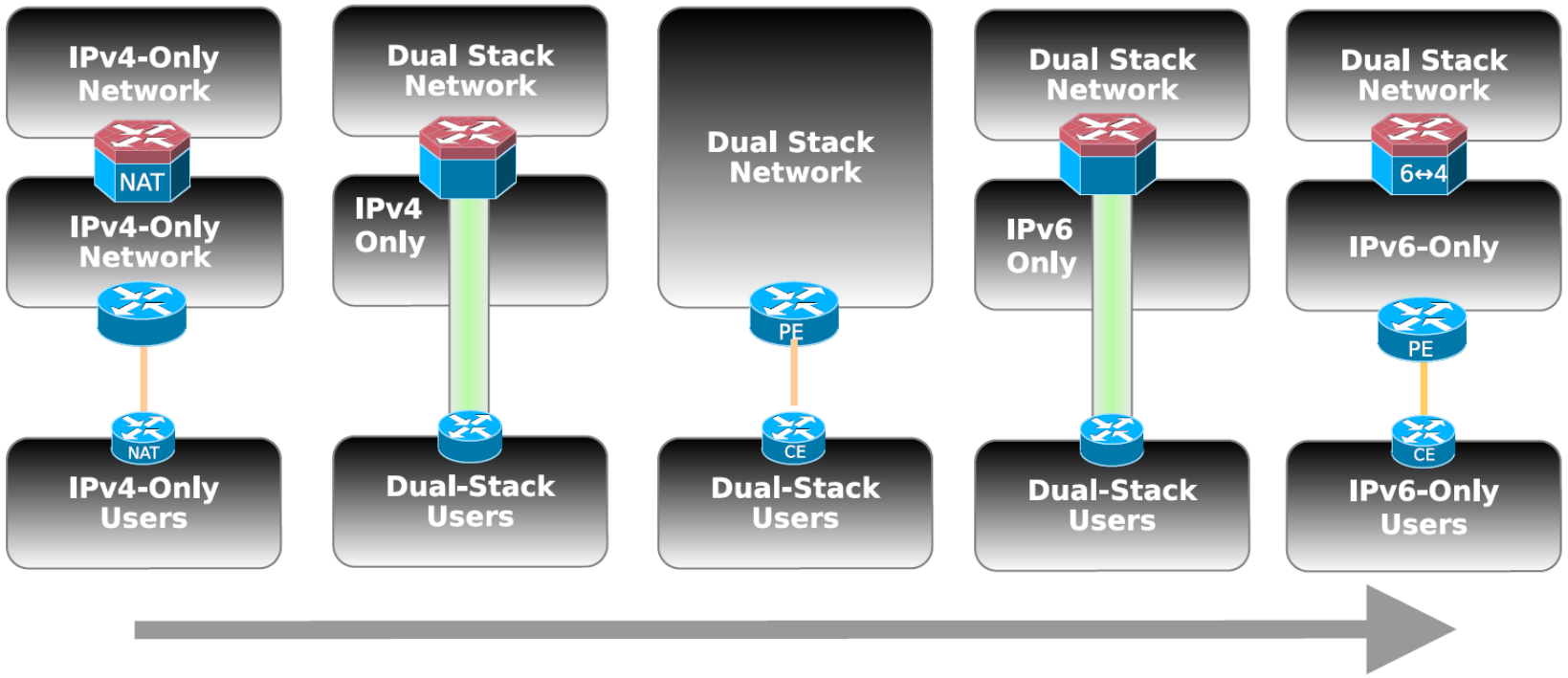
Multae Gentes

- Spencer Dawkins, Huawei
- Guillaume Leclanche, Viagenie
- Diego Lopez, Telefonica I+D
- Felix Lu, Huawei
- Qiong Sun, China Telecom
- Tina Tsou, Huawei
- Wenfeng Xia, Univ. of Sci. & Tech. of China
- Chongfeng Xie, China Telecom
- Haiyong Xie, Huawei

Status Quo in IPv6 Transition



- Slow transition
- Many solutions and multiple scenarios co-exist
- Equipment does not support multiple IPv6 transition technologies at the same time
- Operational complexity and risks in the phased approaches

The Goals

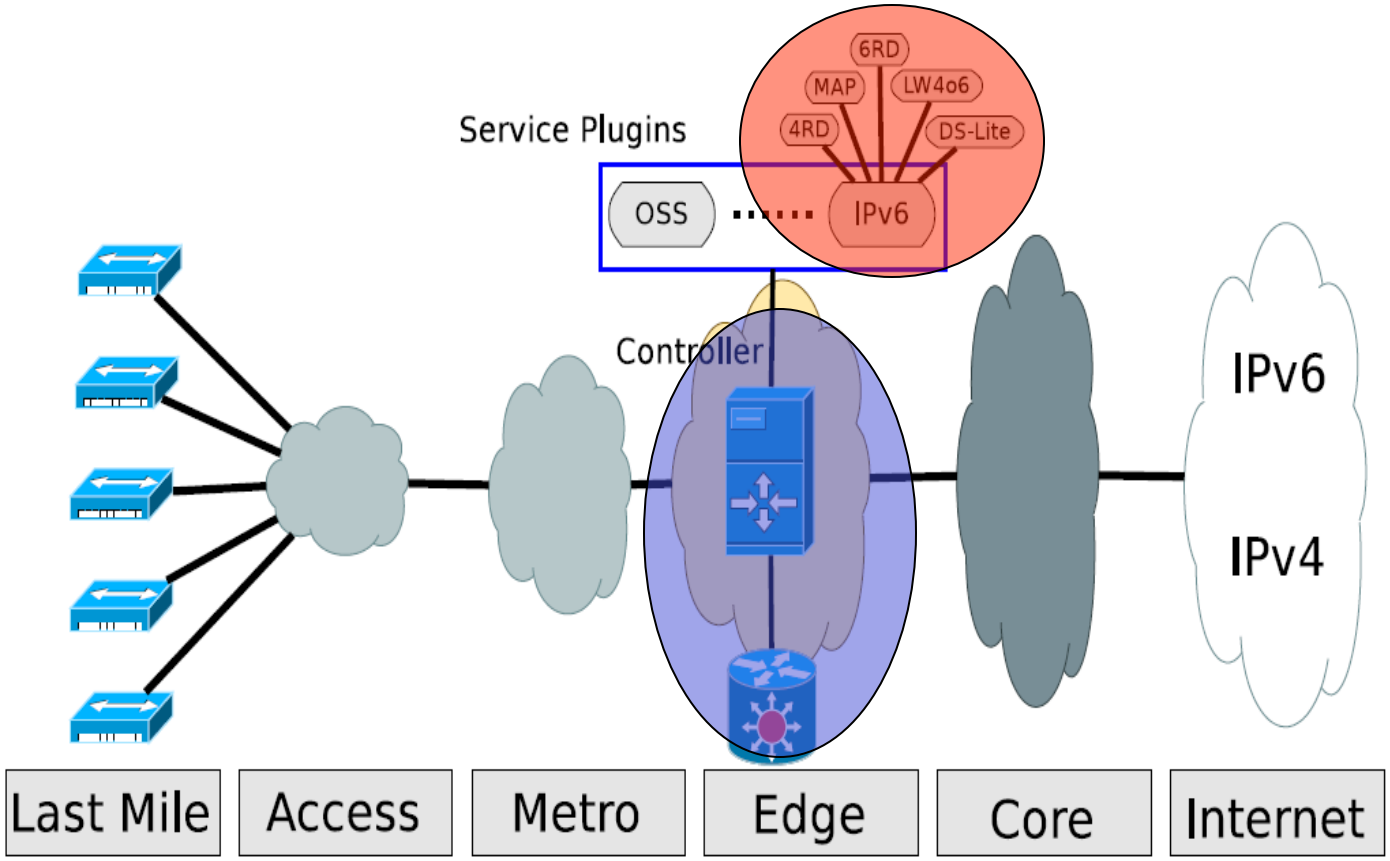
- Design a unified approach to IPv6 transition
  - Supported by uniform equipment
- Low deployment and operational costs
  - In despite of the migration path
  - And even able to adapt to diferent ones
  - Able to accommodate existing and future IPv6 transition
- Keep user/application control on the when and how to start the transition

Applying SDN

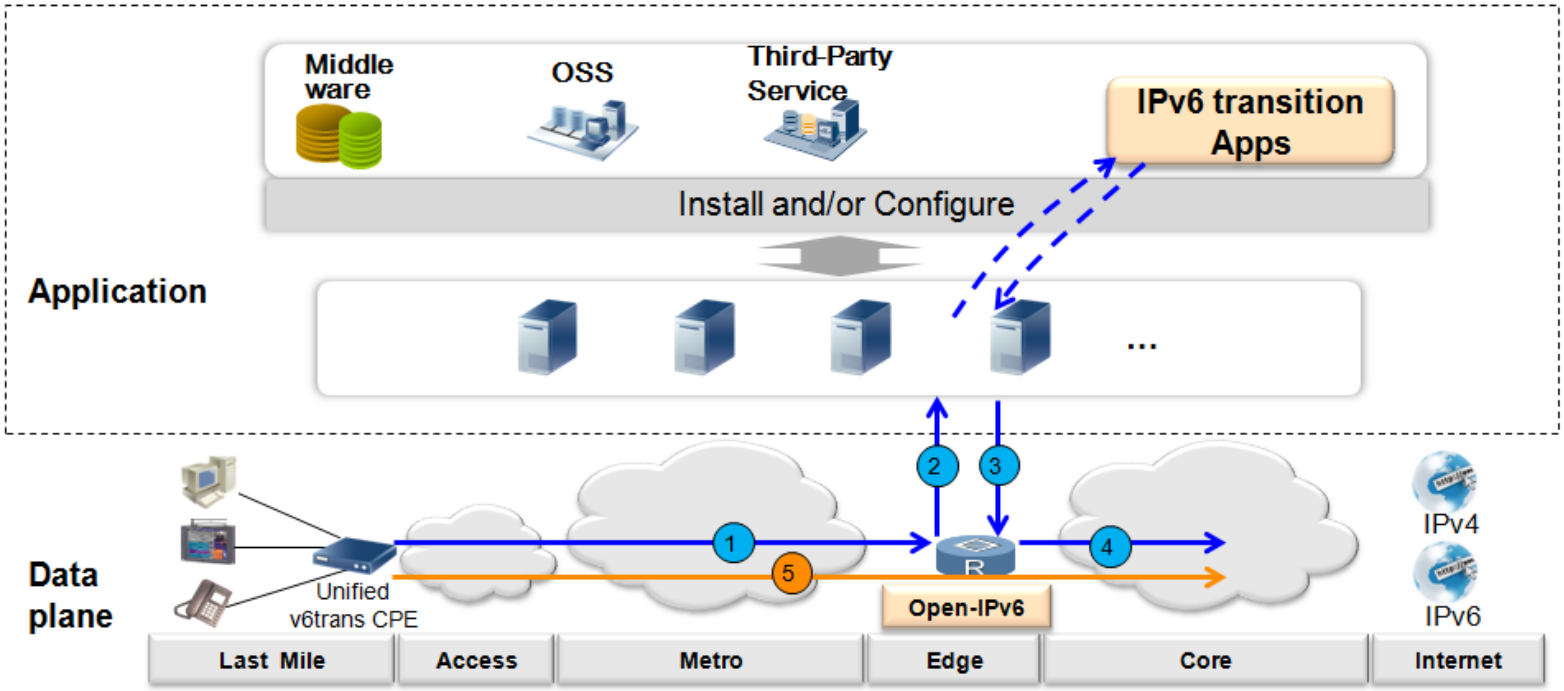
- Decouple network equipment and the operation of specific IPv6 transition schemes
  - The archetypal data/control planes separation in SDN
- Decouple network equipment and the implementation of specific IPv6 transition schemes
  - Relying on a NBI supporting the dynamic management of IPv6 transition apps
- As a result, support a flexible and adaptive framework for IPv6 transition
  - And move towards network DevOps

The Architecture

- SDN forwarding elements at the IP edge
- IPv6 transition schemas are implemented as SDN Apps
  - Loadable plugins for the controller
- OSS uses a NBI to load apps and configure them



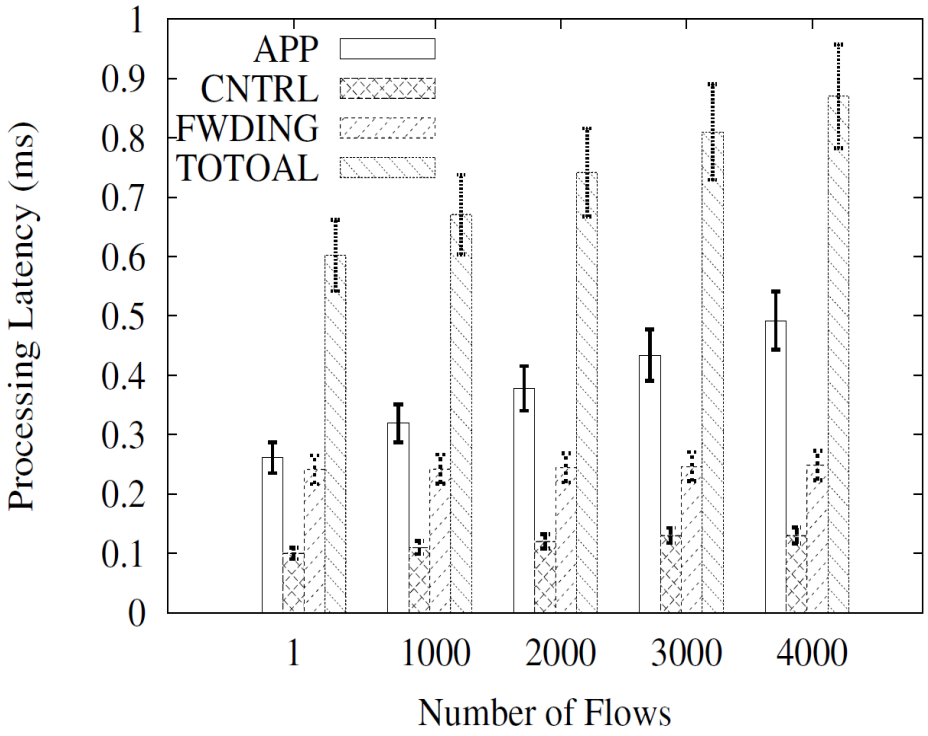
The Data and Control Flows



- Require support for IP-in-IP encapsulation in OpenFlow
  - Being discussed as an extension
  - MTU issues
- Require a NBI spec able to support plugin deployment

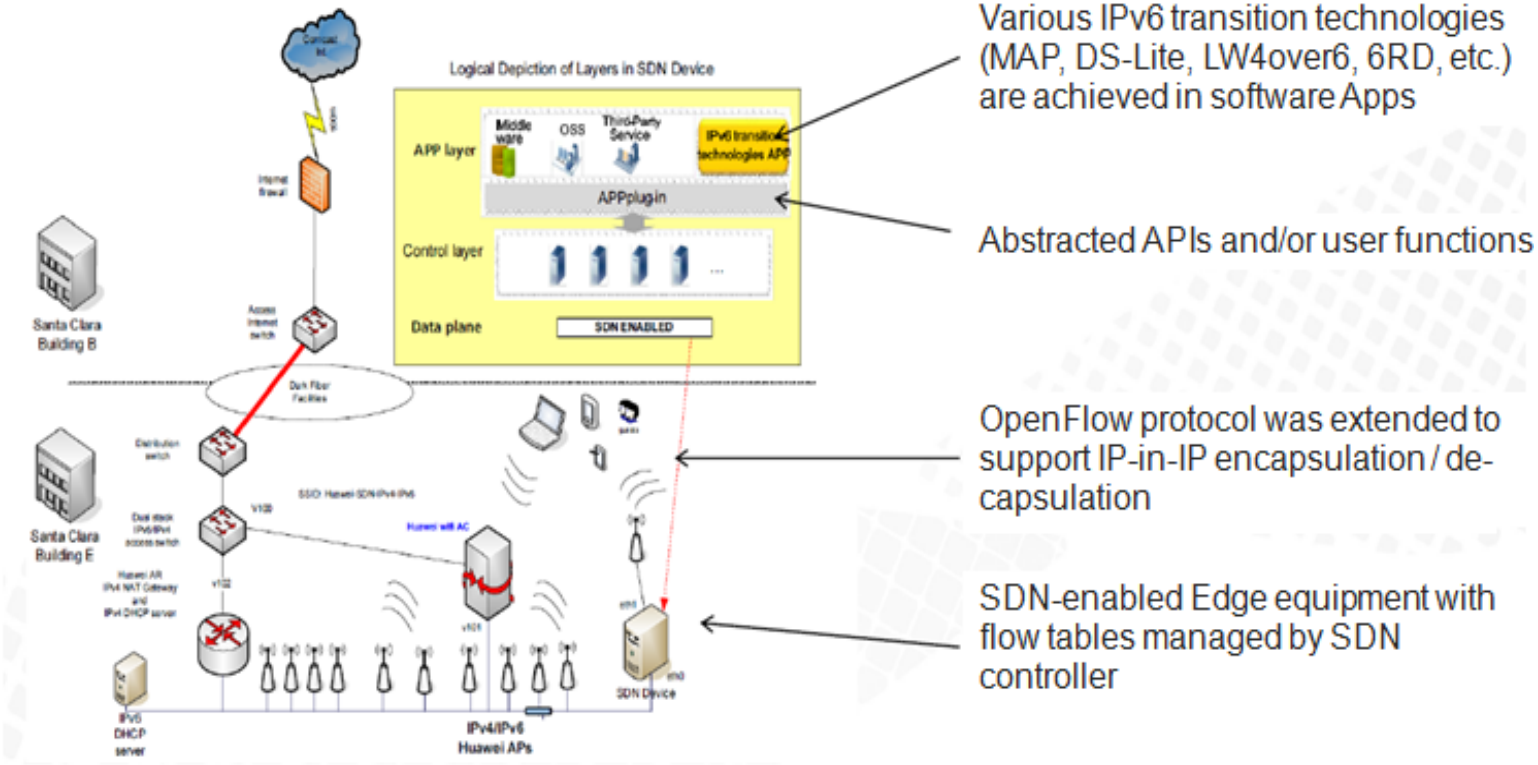
The Lab Experiments

- Use flow generators to generate a varying number of flows
- Use commodity hardware
- The results showed that a reasonably large number of flows could be handled with *very high cost-performance efficiency*



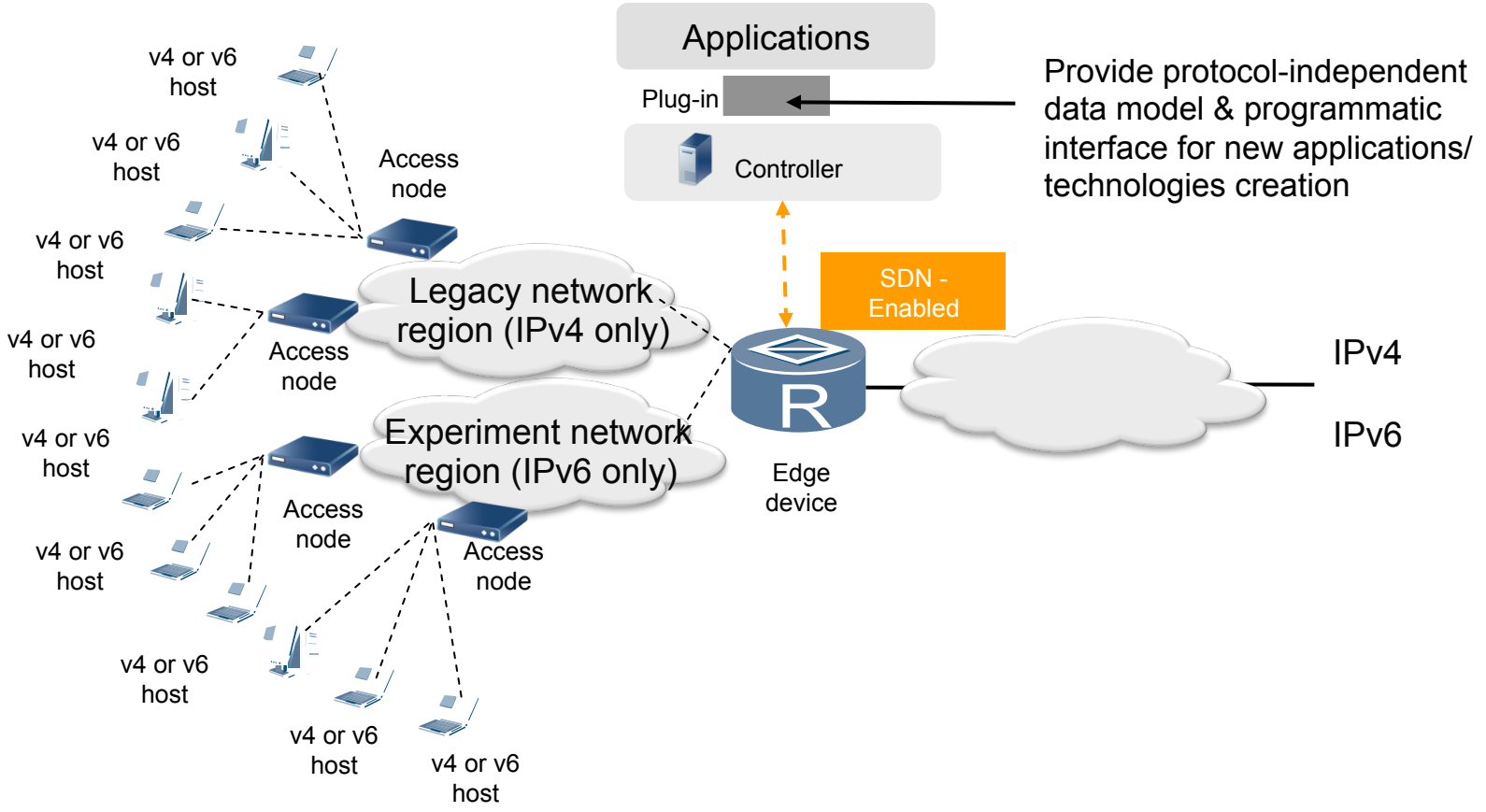
The First Live Experiment

- Internet access for 270+ participants at the ETSI Network Function Virtualization 2nd meeting on 22-23 April 2013

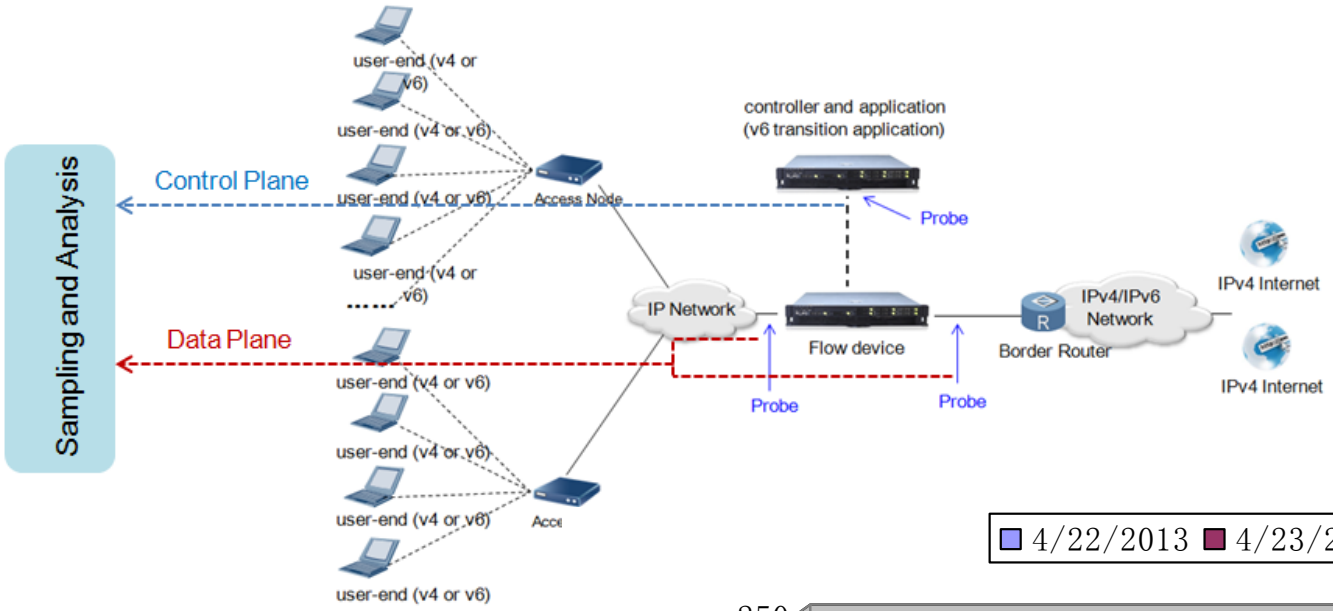


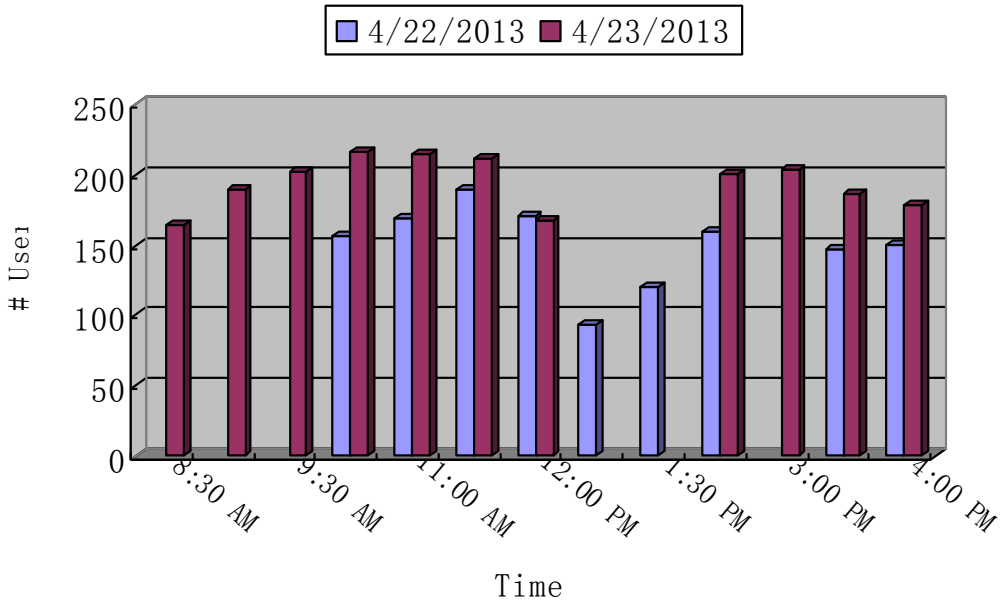
And a Second One

- Internet access for 800+ participants the Global Open Networking and SDN Conference 2013 in Beijing on 29-30 August 2013

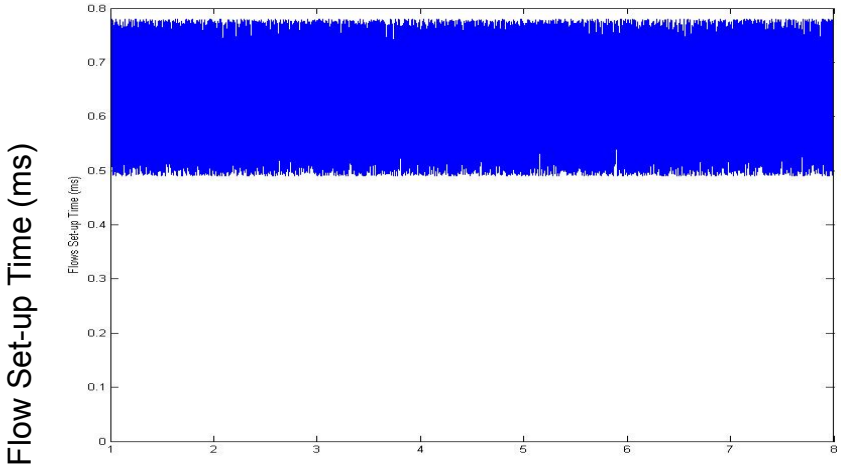


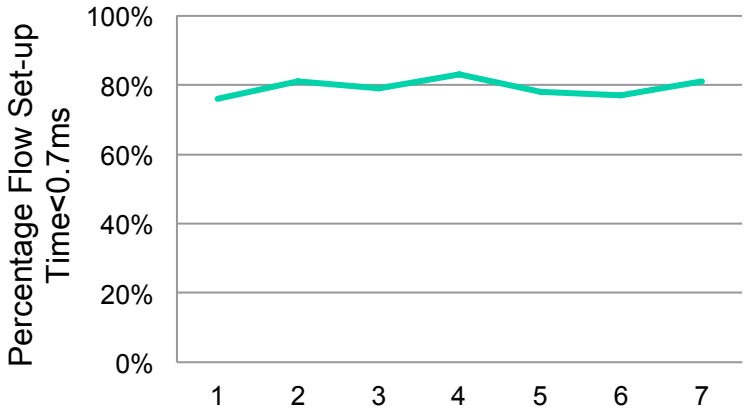
Monitoring the Live Labs



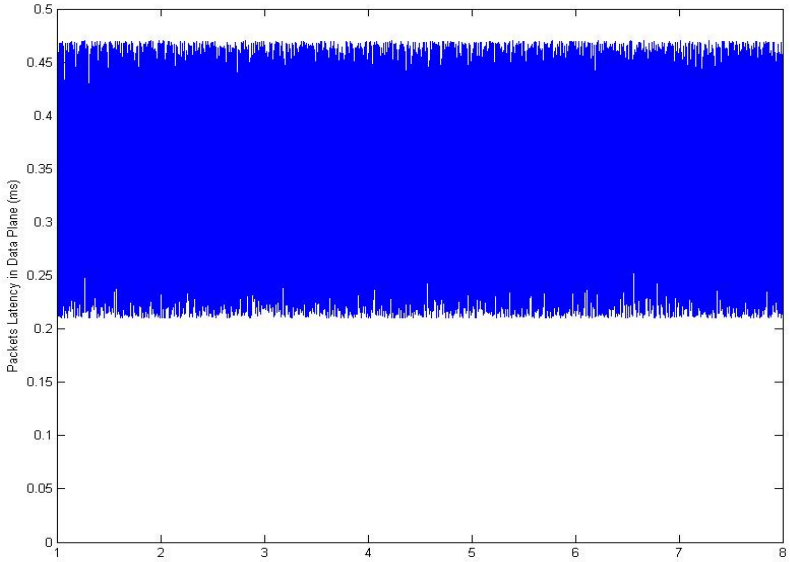


Monitoring Results

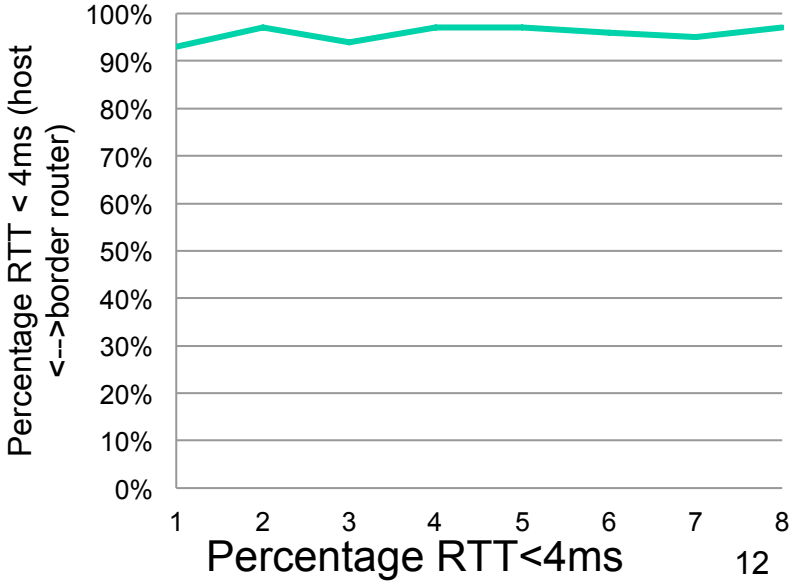




Flow Set-up Time



Packet Latency in Data Plane



An OSS-like Mobile App

- Demonstration of the NBI concepts
- Controls the deployment and configuration of several IPv6 transition mechanisms
  - Illustrated through the Santa Clara live experiment
- Available for Android and iOS
  - http://www.huawei.com/enmobile/app/
  - Google Play
  - (Apple Store soon)

As a Summary

- SDN is applicable to ease IPv6 transition
  - Low cost
  - High performance
  - Unifying existing IPv6 schemes
- A practical solution for this has been demonstrated
  - Eating our own dog food
  - Mature enough to go for real deployment
- In the path of network DevOps
  - Extensibility via programmability
  - Implementation, deployment and operation
  - Streamline the OSS

For more details, please refer to our ACM SIGCOMM 2013 poster titled "*A Software Defined Approach to Unified IPv6 Transition*"

More on This at IETF 88

- Demo at Bits 'N Bites
  - 7th November, 19:00-21:00. Regency Ballroom D,E,F
- Several -00 drafts
  - draft-sun-openv6-problem-statement-00, *Problem Statement for Openv6 Scheme*
  - draft-liu-openv6-architecture-00, *Openv6 Architecture for IPv6 Deployment*
  - draft-sun-v6ops-openv6-address-pool-management-00, *Address Management for IPv6 Transition*
  - draft-zhou-netmod-openv6-transition-cfg-00, *A YANG Data Model for Open IPv6 Transition*
- And a call for a Bar BoF