Virtualized Services via SDN Based End-to-End Networking

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Introduction

- Existing infrastructure: no dedicated bandwidth or priority based communications
- Current Internet capacity can be overloaded: no method to dynamically limit bandwidth
- Current trend towards cloud:
  Remote resources / accessibility / security / cloud computing / cross platform
- Presented SDN based virtualized services/applications can alleviate these problems

Why SDN?

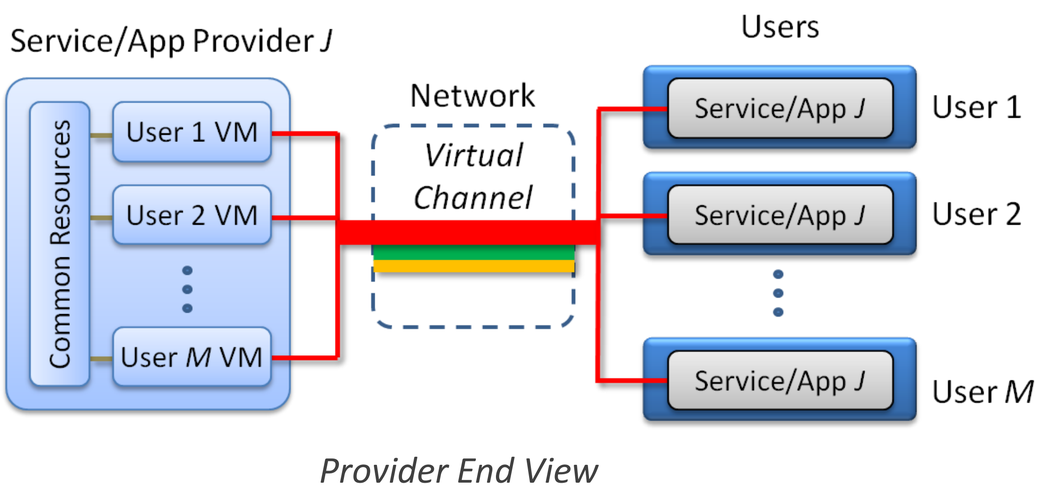
- Dynamic control of network:
  - *Bandwidth allocation*
  - *Priorities*
- Resilience/Fault tolerance:
  - *Decoupled control plane*
  - *Easy reprogramming*

Architecture

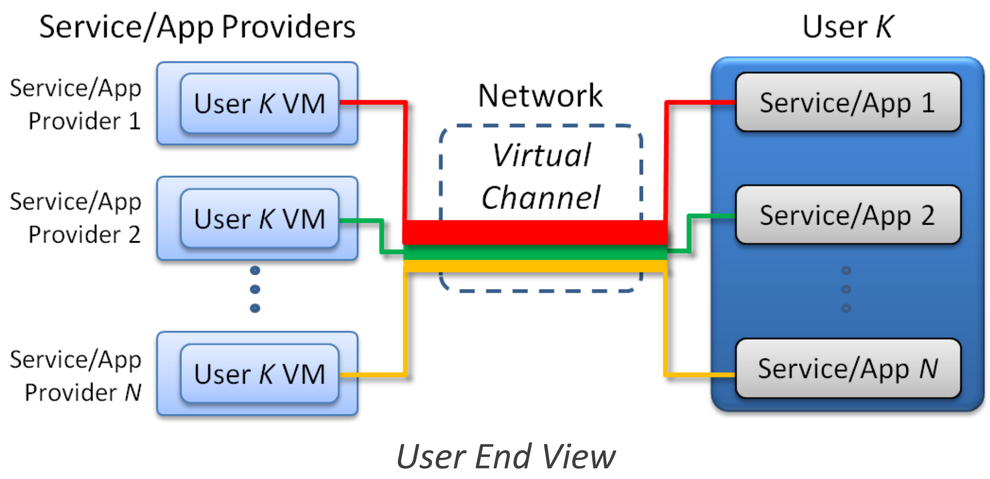
Each service has a virtual *"channel"*:
- Encapsulates service from end-to-end
- Completely virtualized
- Through-network isolation of service

Each user Application runs on a VM residing on the service provider server:
- Thin client implementation
- Virtualization through hardware

Dynamic control of the network:
- SDN enables dynamic control
- Dynamic priorities
- Dynamic bandwidth allocation

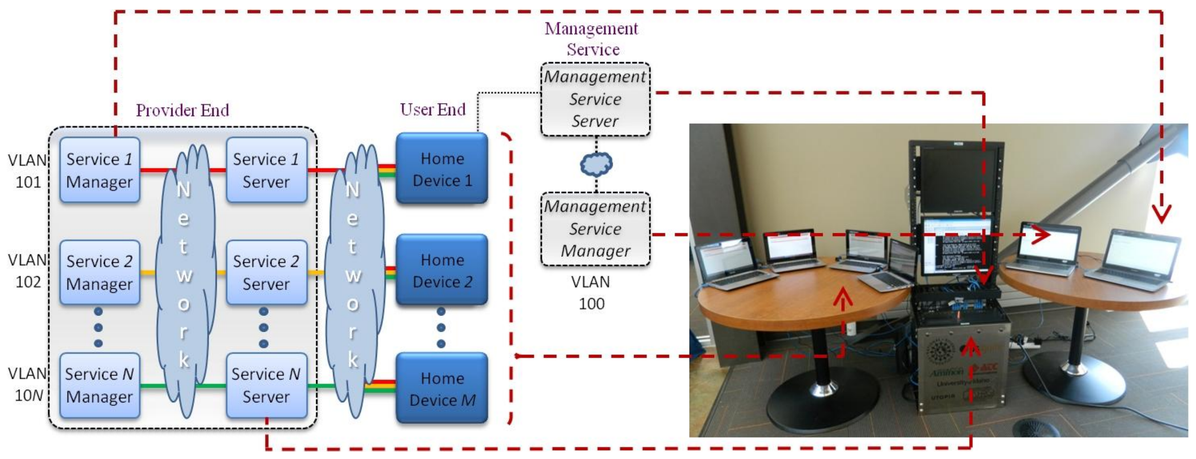


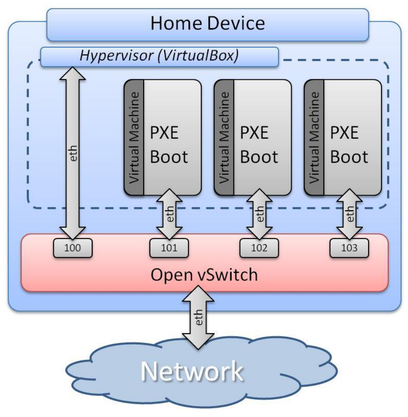
Provider End View



User End View

Implementation





Provider End:
- Server for each application
- VLAN for specific application

User End:
- VMs pushed to user end via LTSP
- Thin client (VM running on server)
- Each VM connected to unique VLAN

Software: (GNU Public Licensed)
- Floodlight Controller
- VirtualBox
- LTSP - Linux Terminal Server Project

Hardware:
- HP E3800 OpenFlow switch
- Runs in hybrid mode

Highlights

- Fully thin client on user end
- Isolation of services
- Dynamic bandwidth control
- Priority based packet forwarding
- Scalability
- Resilience/Fault tolerance

Documentation

Support and documentation via *Sourceforge* and dedicated website

nsec.if.uidaho.edu

Visit Website

Examples

- High priority to critical communication:
  - *Critical infrastructure /Government communication*
- Dynamic bandwidth control:
  - *Time based (night time setbacks)*
  - *Usage based / Situation based (disaster situation)*
- Easy network reprogramming: *Reduced down times*

Future Work

- Migration to GENI
- Dynamic control of packet forwarding via *OpenFlow*
- Larger scale implementation testing / performance analysis
- Application delivery via wireless communication
- Full thin client implementation on the home device
- Implementation for Mobile devices