Software Defined Networking

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In this course, you will learn about software defined networking and how it is changing the way communications networks are managed, maintained, and secured.

Applications of Virtual Networking

- ◎ Experimentation on production networks
  - Can run (virtual) experimental infrastructure in parallel with production
- ◎ Rapid deployment and development
  - Can deploy services independently from underlying vendor hardware
- ◎ Dynamic scaling of resources
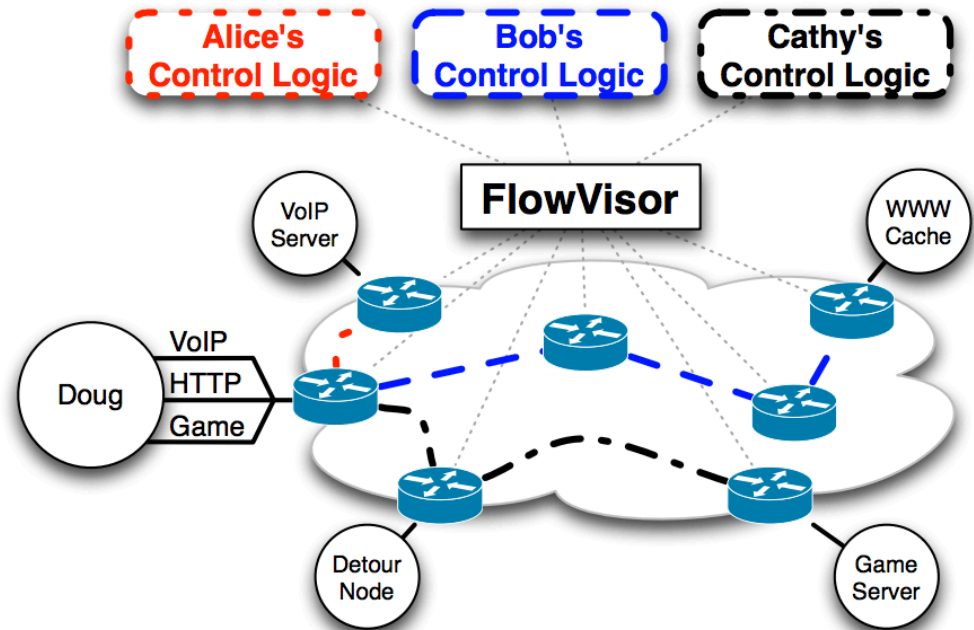 - Can allocate from "pool" of resources
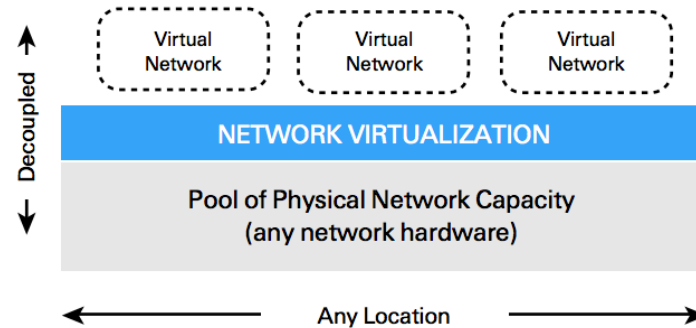
Experimentation on Production Networks
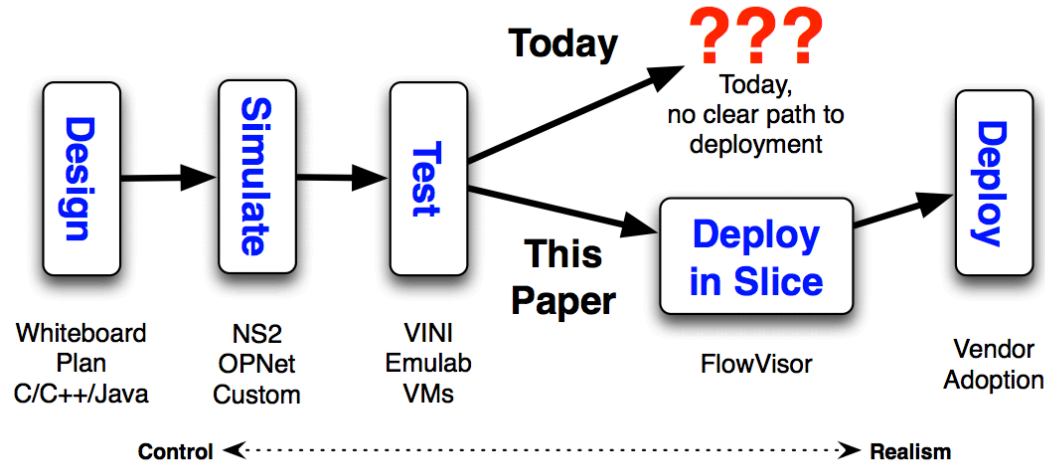
- How to test and deploy a ¨paper design˝?
- **Goal:** Realism
- **Ideally:** Deploy in parallel in production

FlowVisor: Virtualizing Network Control

- User ("Doug") can let different flows be controlled by different groups of researchers

- Virtualization of control based on "flow space" (IP address, port, etc.)

Sherwood, Rob, et al. "Can the production network be the testbed."
Proceedings of the 9th USENIX conference on Operating systems design and implementation. USENIX Association, 2010.

# Rapid Deployment of Services: Nicira Network Virtualization Platform

- Abstraction layer between hosts & underlying network
- Open vSwitch in host hypervisors: abstraction layer
- Managed by distributed controller

http://nicira.com/en/network-virtualization-platform

Nicira NVP: Applications

- ⊙ Dynamic workload placement
  - Multi-tenant data centers
  - Creation of isolated virtual networks for each tenant

- ⊙ Dynamic security
  - Central management of security policies
  - Enforcement per virtual network
  - Independence from VLAN limits

Dynamic Scaling of Resources: Amazon Virtual Private Cloud

◉ Connect logically isolated VM instances to existing network

◉ Connection to existing infrastructure via VPN

http://aws.typepad.com/aws/2009/08/introducing-amazon-virtual-private-cloud-vpc.html
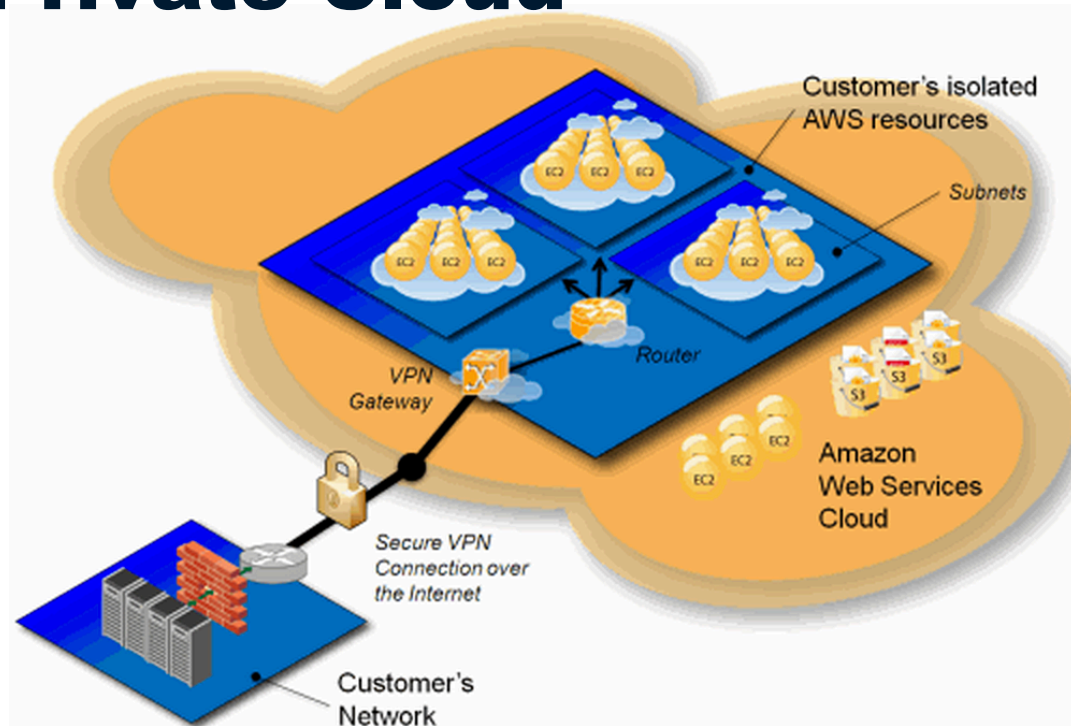
Amazon Virtual Private Cloud

- ⦿ Allows customers to define their own network, address space, etc.
- ⦿ Extend existing enterprise data center
  - • VPN between Amazon VPC and data center
- ⦿ Applications/Benefits
  - • Dynamic scaling
  - • Disaster recovery
  - • Manageability

Many Other Examples of Virtualization

- Wide-Area Virtual Networks
  - Experimental infrastructure: VINI, GENI
  - Value-added services: CABO
  - Multiple control infrastructures: Tempest

- Virtual "Network in a Box"
  - Open vSwitch, Citrix, Vyatta, OpenSolaris, Microsoft Virtual Server

- Network functions virtualization

Summary:
Applications of Virtual Networking

- Experimental deployments
- Isolation on shared infrastructure
- Reuse of resource pool
- Dynamic scaling
- Easier management of "logical" resources