Case study:
Locating performance problems aided by network virtualization

Network diagnosis

- Problem:
  Implementation/configuration issue surface in large-scale, long-term deployments with real user traffic

- Goal:
  - Do not change network under test
  - Avoid probe effect

- Diagnosis methods:
  - Instrumentation
  - Regression tests
Instrumentation

- Pair production VNet with monitoring VNet
- Copy all/selected packets to monitoring VNet
- Processing is accounted to monitoring VNet

Regression testing – Shadow Vnet

Input dist'ed to Vnet 1.0 and Vnet 1.1
Output of Vnet 1.0 dist'ed to ext entities
Regression testing – Shadow Vnet

- Run VNet1.0, VNet1.1 monitoring VNet
- Distribute external input to both VNet1.0 and VNet1.1
- Ctrl compares output behavior of VNet1.0 and VNet1.1 for semantic equality
- Only output of VNet1.0 is distributed to external entities

Example: VoIP with background load

- Phase 1: Minimal background traffic
- Phase 2: Background traffic increases
- Phase 3: Start ShadowVNet: VNET B
- Phase 4: Enable QoS in VNET B
- Phase 5: VNET B becomes operational
Example: VoIP with background load

- User perceived quality is restored when the ShadowVNet is activated

Lessons learned

- New network debugging features
  - Instrumentation
  - Regression tests
  - Distributed debugger

- Goals
  - To **not change** network under test
  - Avoid **probe effect**

- Solution: Network virtualization
  - **Isolation**
  - Accounting of resources
CSD: Reshaping the Internet

- Impact on **users**:
  - Ease of access to relevant information
  - New control plane with new capabilities
  - Easy to introduce new applications with new features
    - Security, mobility, quality of service

- Impact of new **economic models**:
  - New interfaces between providers (network/service)
  - New value-chain and new roles for providers
  - Open interfaces may enable new ecosystems of business alliances

- Impact on **society**:
  - Information society

- Impact on **operators**:
  - Easier network management