HyperFlex: Towards Reliable and Dynamic SDN Virtualization for Next Generation Mobile Networks

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Outline

- Motivation
- SDN Virtualization Overview
- State of the Art Limitations
- HyperFlex Features
- HyperFlex Design
Motivation

- Why do we need virtualization “slicing“?
  - next generation networks

- NGMN 5G white paper [1]
  - Network as a Service (NaaS)
  - logical virtual mobile network slices
  - reliable and on-demand slices

- METIS 5G system concept and technology roadmap [2]
  - application and service differentiation
  - logical virtual mobile network slices
  - heterogenous and dynamic slices

Source: NGMN 5G white paper
Motivation

- Why do we need SDN virtualization “slicing“ in next generation 5G?
  - Bring your own controller
  - Full flexibility and programmability
### SDN Virtualization Overview

- **How to achieve slicing for SDN networks?**
  - SDN virtualization layer, i.e., SDN hypervisors
  - e.g. FlowVisor [3], OpenVirteX [4]

- **What should an SDN hypervisor do?**
  - Virtual SDN abstraction
  - Control plane translation
  - Data and control slice isolation
State-of-the-art Limitations

- SoA SDN virtualization solutions in survey [5]

- SDN Slices
  - focus on data plane slices
  - control performance impacts the data plane performance in SDN!

- Management
  - automated slice request is not addressed
  - admission control interfaces are missing

- Deployment
  - no mechanisms to change the deployment on run time
  - e.g., automate adding or removing of a hypervisor instance
HyperFlex Features

- Admission Control [6-7]
  - automated request of virtual SDN slices
  - guarantees for data and control plane
  - run time update to slice
  - embedding of virtual links on the physical network

(a) Tenant View  
(b) HyperFlex View
HyperFlex Features

- **Performance Monitoring [6-7]**
  - monitor the performance of the running hypervisors, e.g., CPU
  - monitor the performance of the SDN slices
  - control plane latency
  - control plane loss rate

(a) Hypervisor performance

(b) Tenant control performance
HyperFlex Features

- Dynamic Deployment “Orchestration” [8-9]
  - cope with the slice dynamics, e.g., new requirements, time-varying traffic, …
  - transparent to tenants, i.e., no interruption and no control loss
  - optimal placement of SDN hypervisors
HyperFlex Design

- HyperFlex is an SDN virtualization layer that provides flexible, reliable and dynamic SDN virtualization.
Summary

- SDN virtualization is an important target in next generation 5G

- SDN virtualization tools are still in an early stage

- We are working on HyperFlex towards a flexible, reliable and dynamic SDN virtualization layer for next generation networks
References List


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Thank you for your attention!

Questions?