



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

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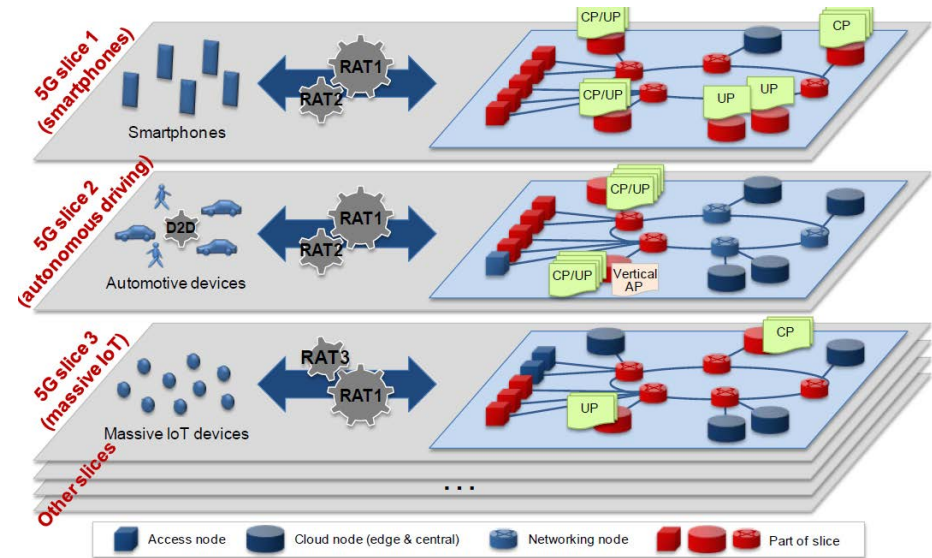
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- Motivation
- SDN Virtualization Overview
- State of the Art Limitations
- HyperFlex Features
- HyperFlex Design

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

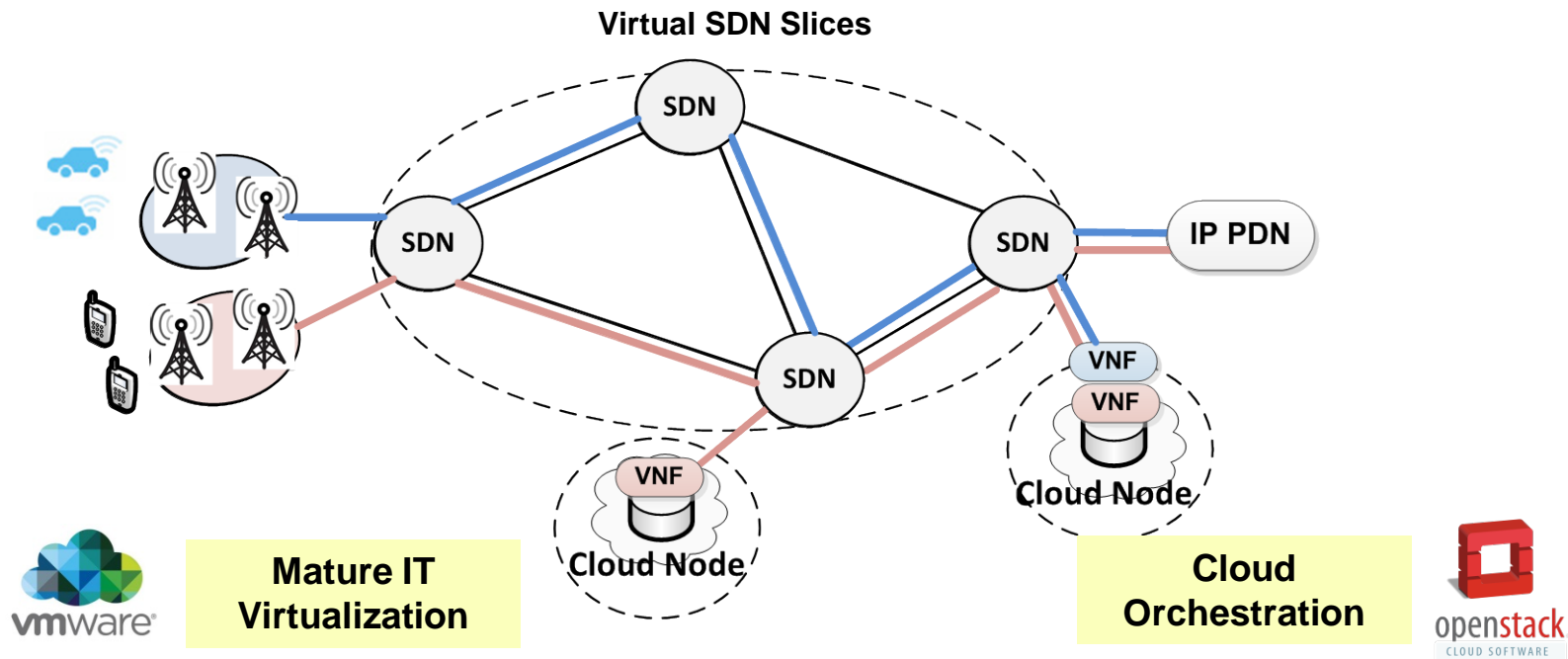


Source: NGMN 5G white paper

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

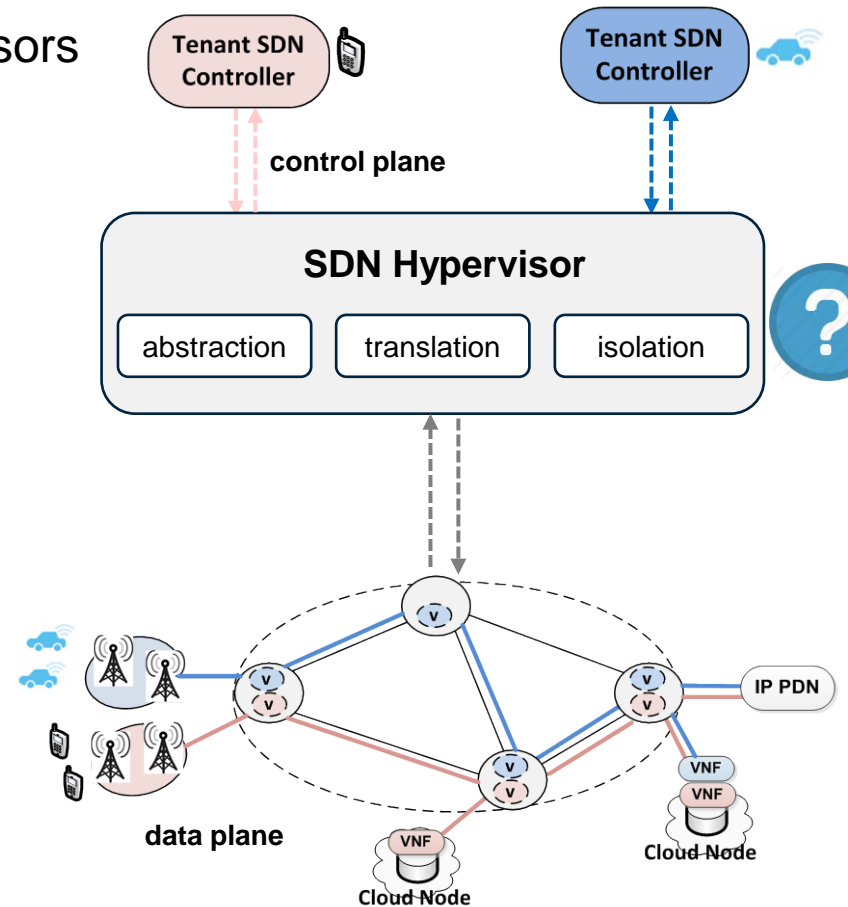
Motivation

- 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



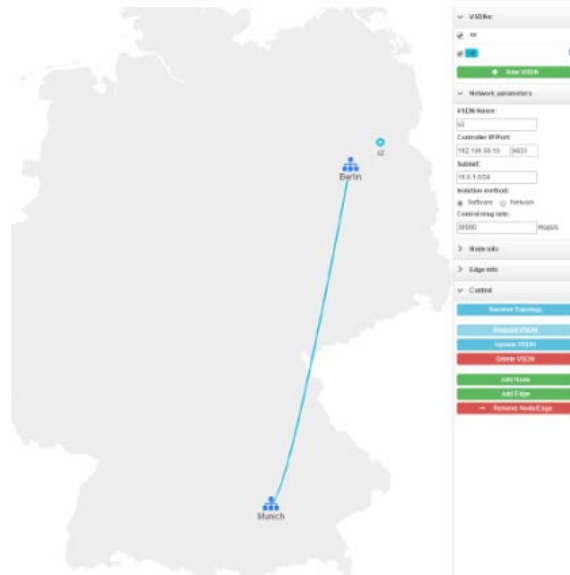
State-of-the-art Limitations



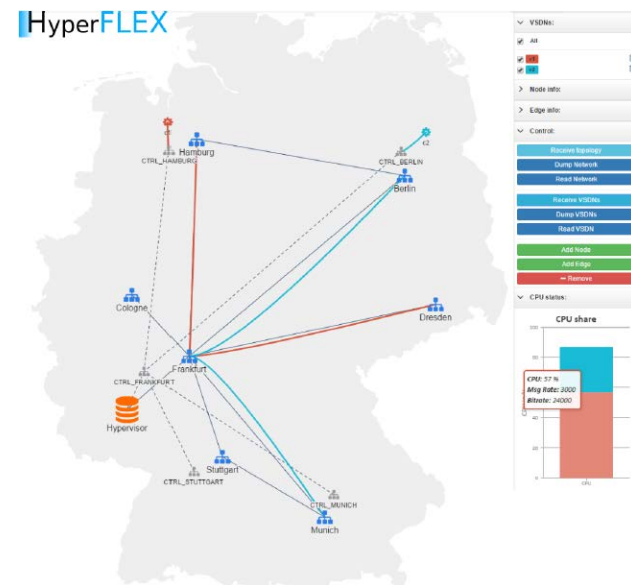
- SoA SDN virtualization solutions in survey [5]
- SDN Slices
 - focus on data plane slices
 - control performance impacts the data plane performance in SDN!
- Management
 - automated slice request is not addressed
 - admission control interfaces are missing
- Deployment
 - no mechanisms to change the 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



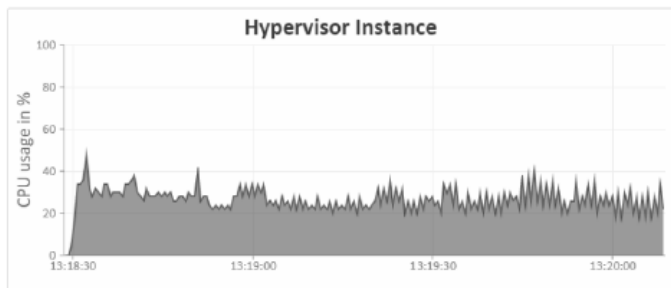
(a) Tenant View



(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



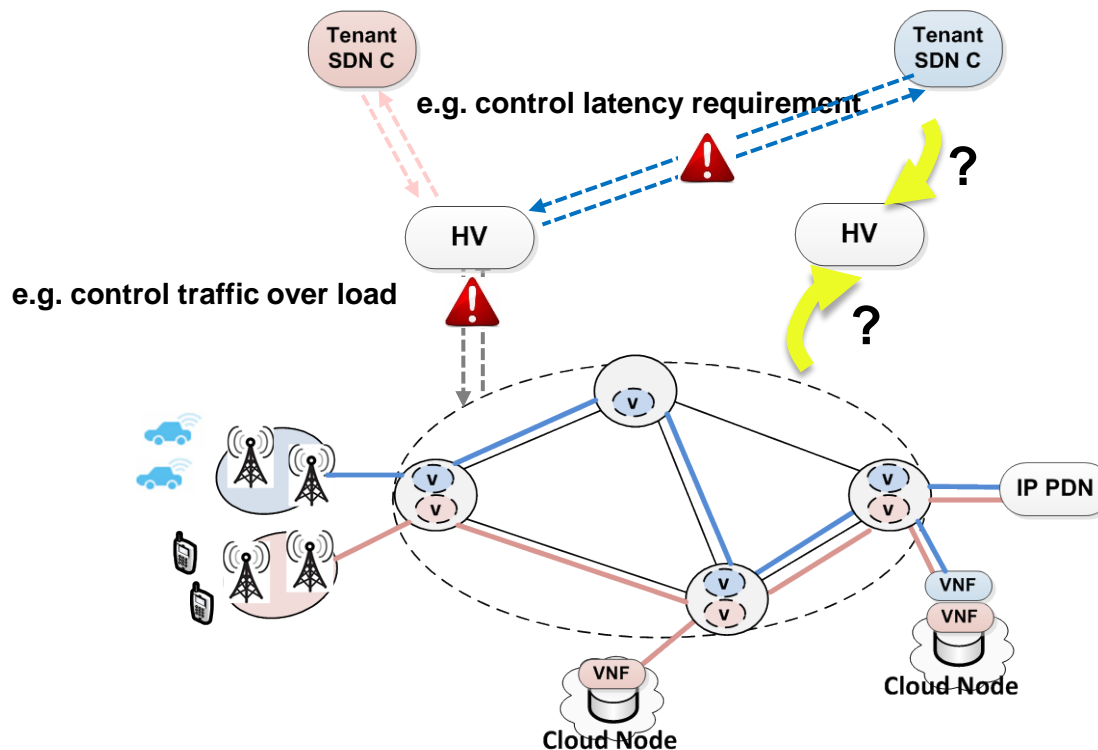
(a) Hypervisor performance



(b) Tenant control performance

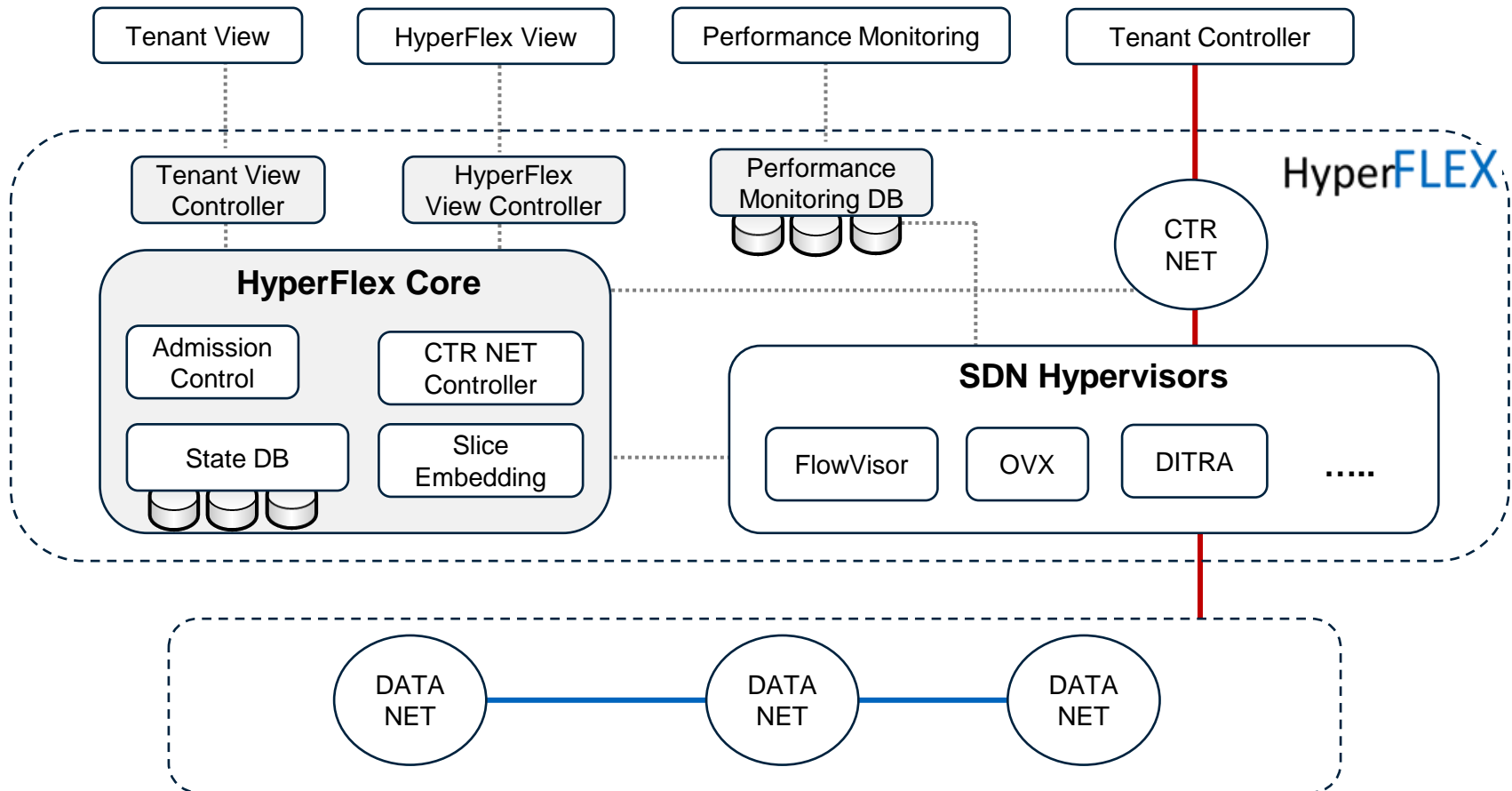
HyperFlex Features

- 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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- [6] A. Blenk et al., HyperFlex: An SDN Virtualization Architecture with Flexible Hypervisor Function Allocation, IM, 2015
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- [8] A. Basta et al., Towards a Dynamic SDN Virtualization Layer: Control Path Migration Protocol, CNSM ManSDN/NFV, 2015
- [9] A. Blenk et al., Pairing SDN with network virtualization: The network hypervisor placement problem, IEEE NFV-SDN, 2015

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Thank you for your attention!

Questions?