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ETSI

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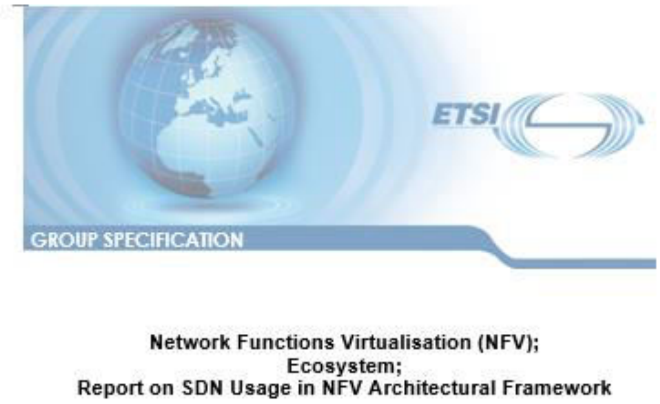
NFV TUTORIAL SESSION - SDN Usage in an NFV Architectural Framework

NFV#12

Monday 26th October, 12:30 – 14:00

Marie-Paule Odini, Rapporteur, HP

How to use SDN with an NFV environment ?



GROUP SPECIFICATION

Network Functions Virtualisation (NFV);
Ecosystem;
Report on SDN Usage in NFV Architectural Framework

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SDN Definition – ITU-T

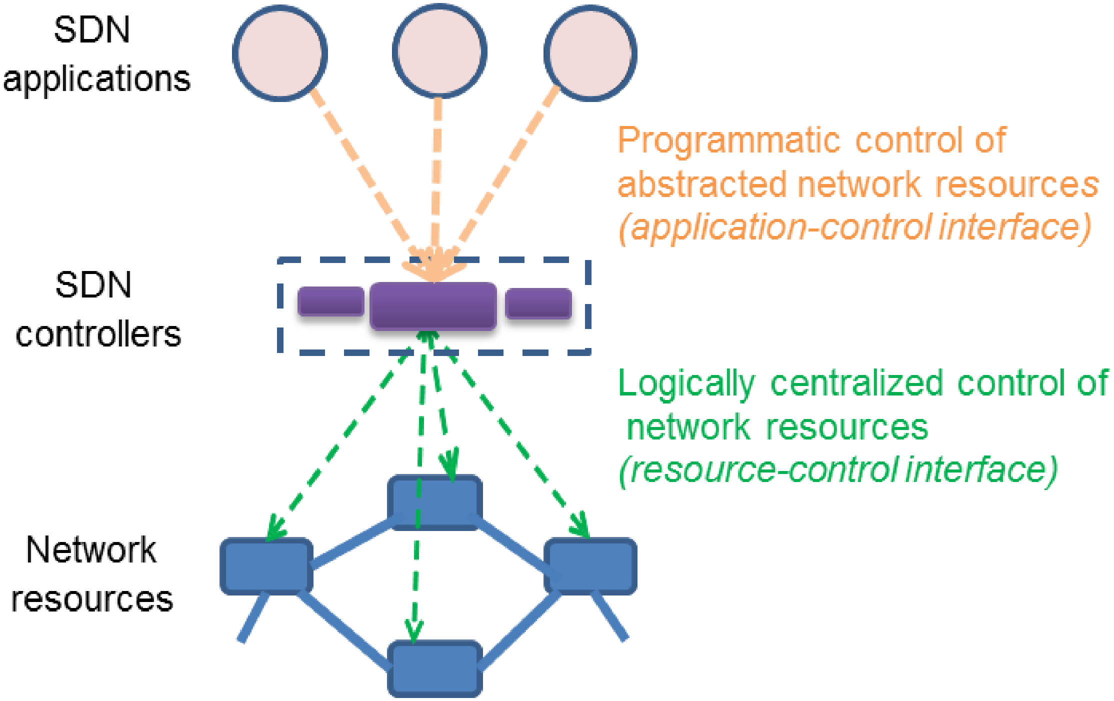
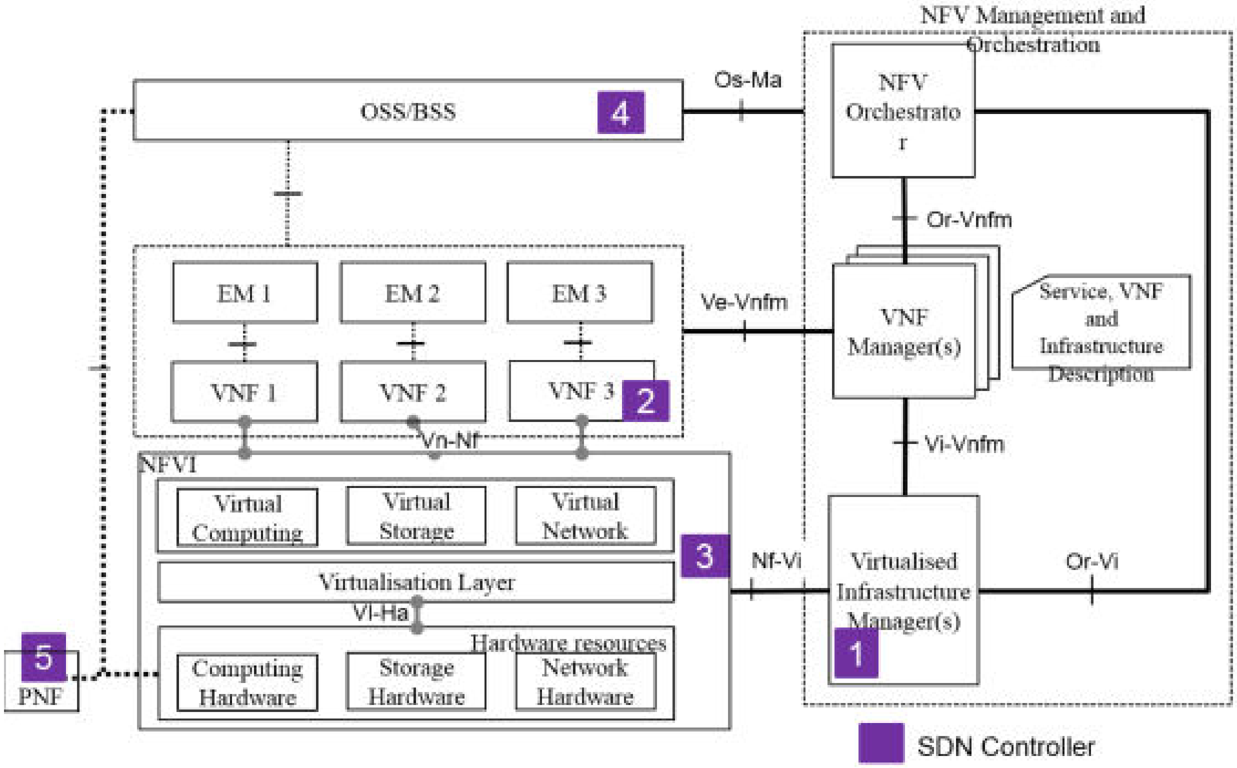

SDN applications
Programmatic control of abstracted network resources *(application-control interface)*
SDN controllers
Logically centralized control of network resources *(resource-control interface)*
Network resources

Figure 1: Concept of SDN (from ITU-T Recommendation Y. 3300)

⇒ REC#1 - enable a given SDN controller to always be able to communicate with its associated SDN resources

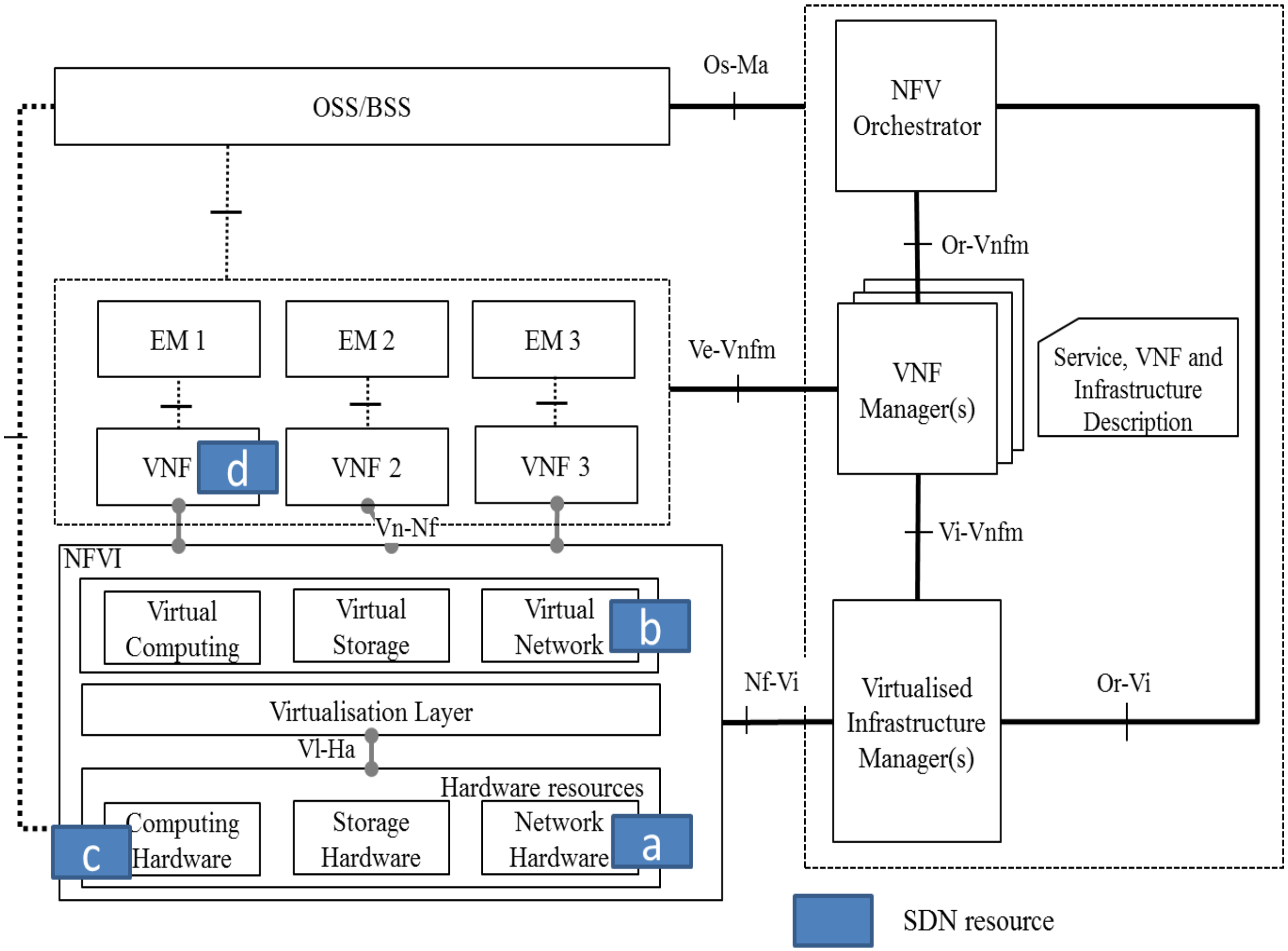
SDN Controller in NFV architectural Framework



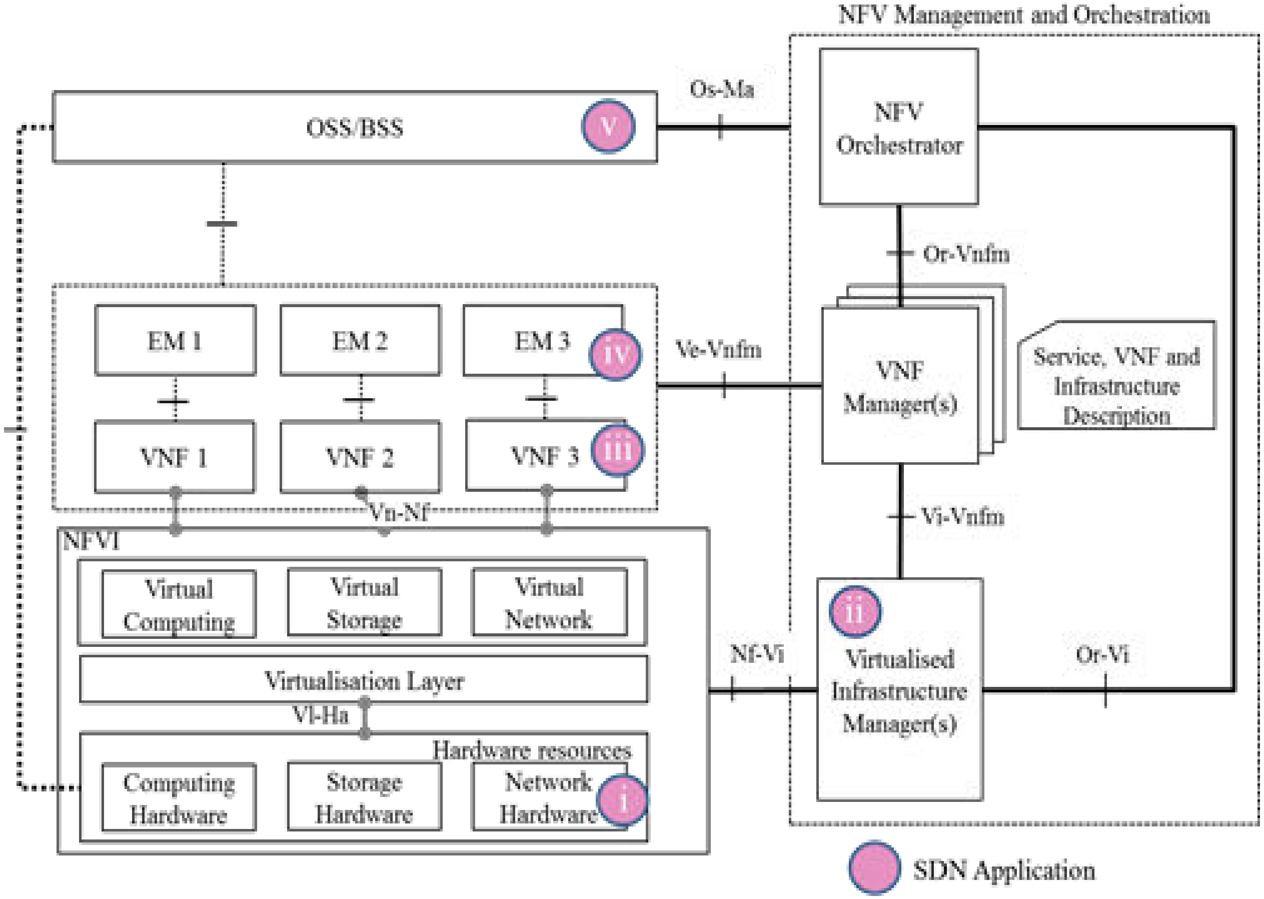
⇒ REC#2 - support SDN controller being a PNF

⇒ REC#22 - requirement be specified for the Nf-Vi interface to support operations going to an SDN controller.

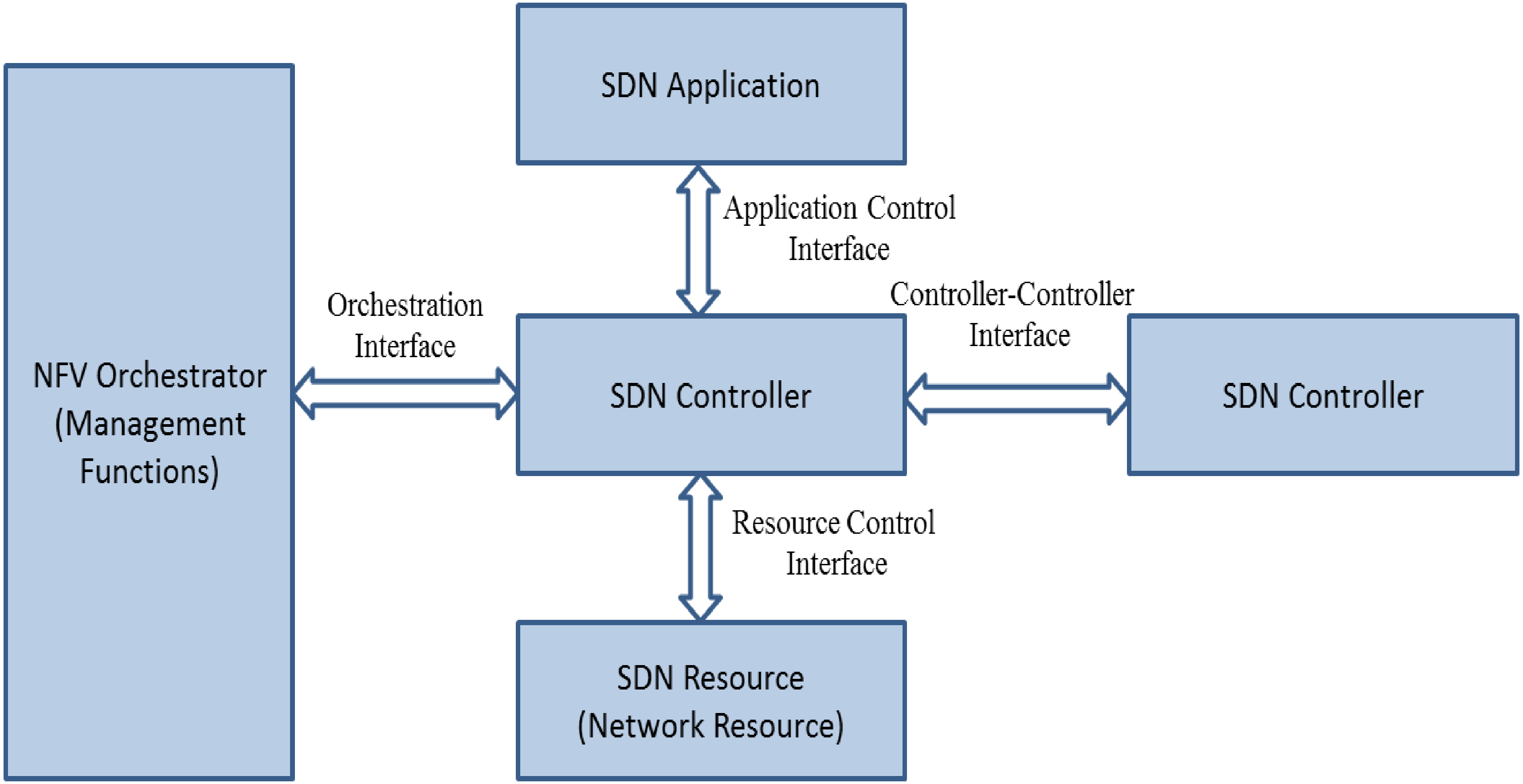
SDN resource position in ETSI NFV architecture



SDN application position in ETSI NFV architecture

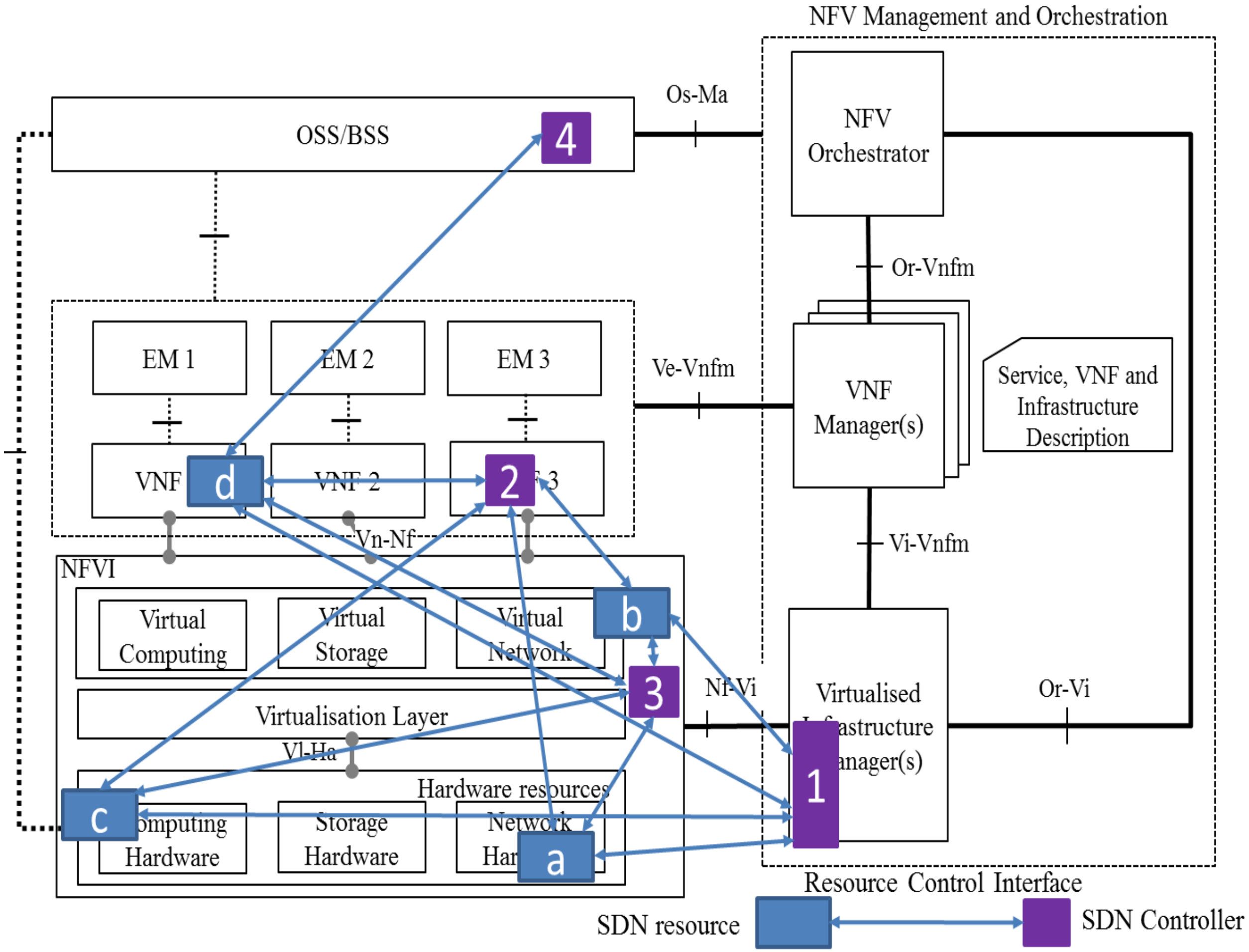


SDN Controller Interfaces


SDN Application
Application Control Interface
NFV Orchestrator (Management Functions)
Orchestration Interface
SDN Controller
Controller-Controller Interface
SDN Controller
Resource Control Interface
SDN Resource (Network Resource)

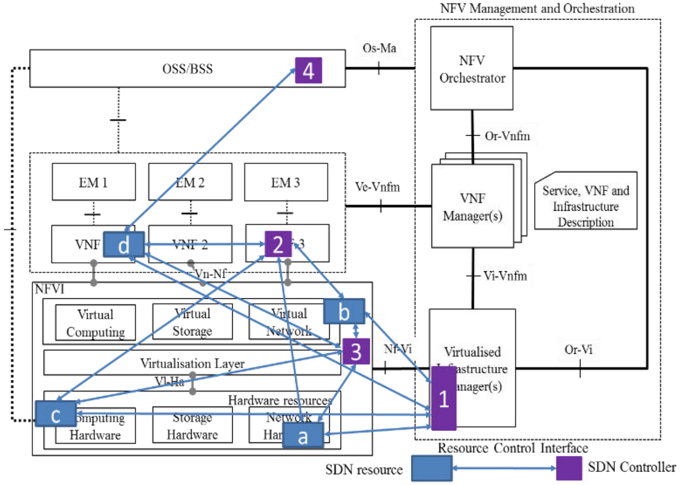
⇒ REC#4 – it is recommended to further study the controller-controller interfaces

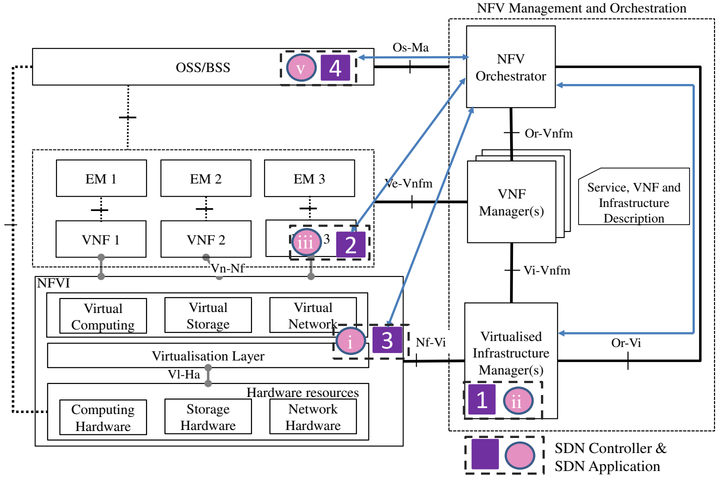
SDN Resource Control interfaces

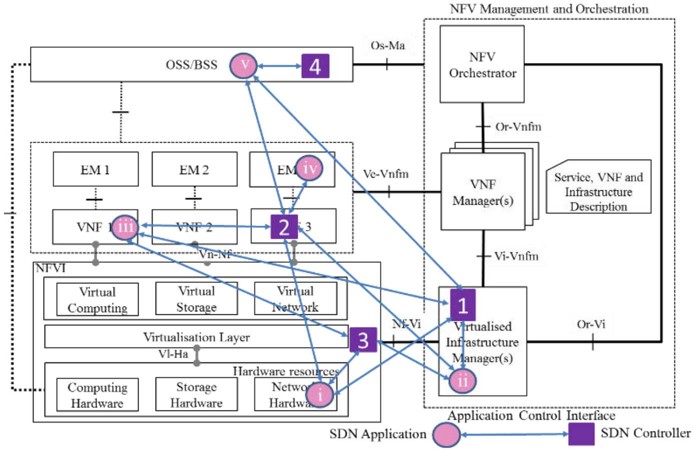


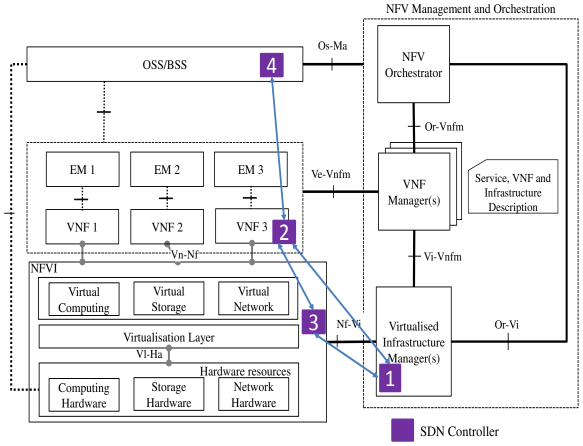
=> REC#20 - further study the coordination of concurrent claims coming from SDN controller or NFV-MANO to shared resources in an NFV environment

SDN interactions summary

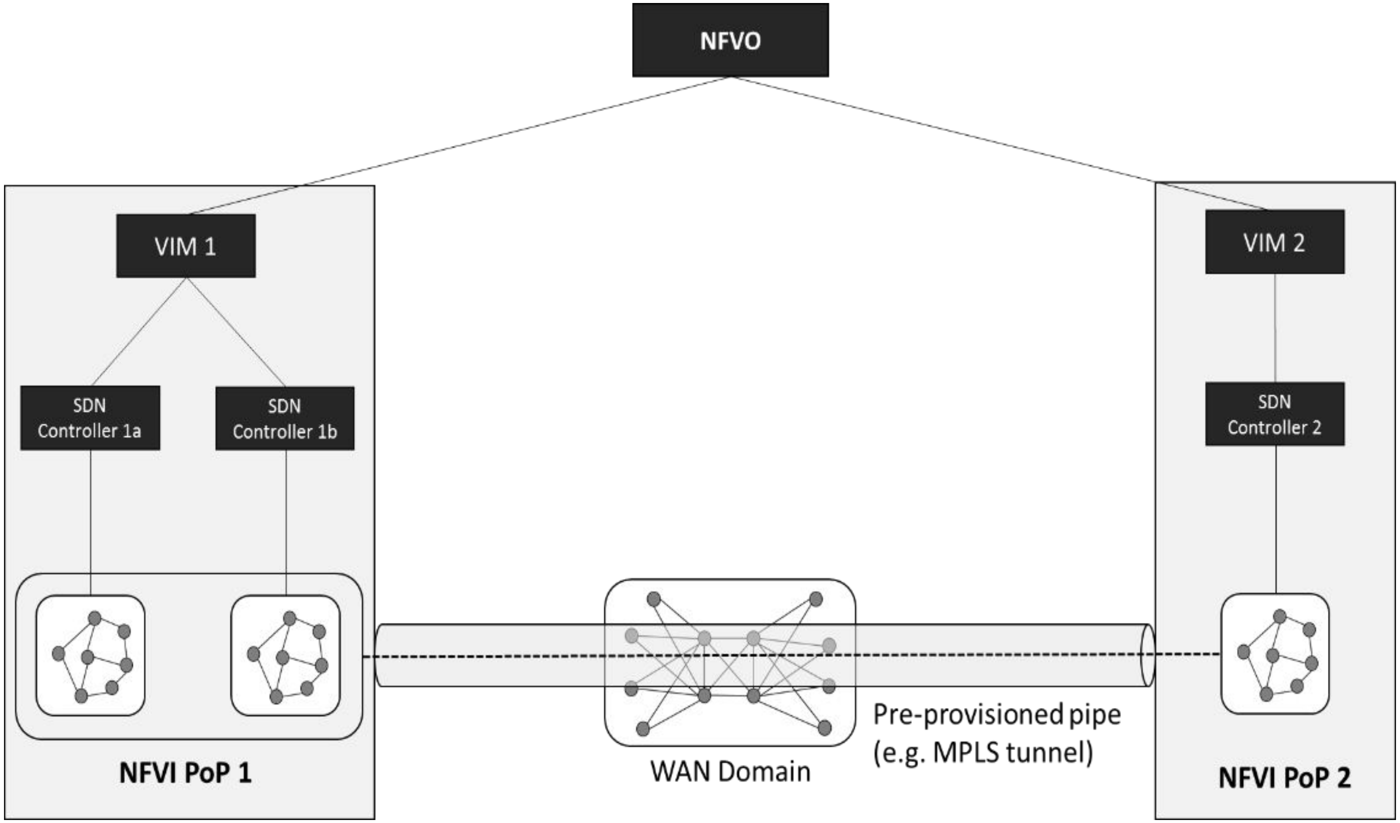






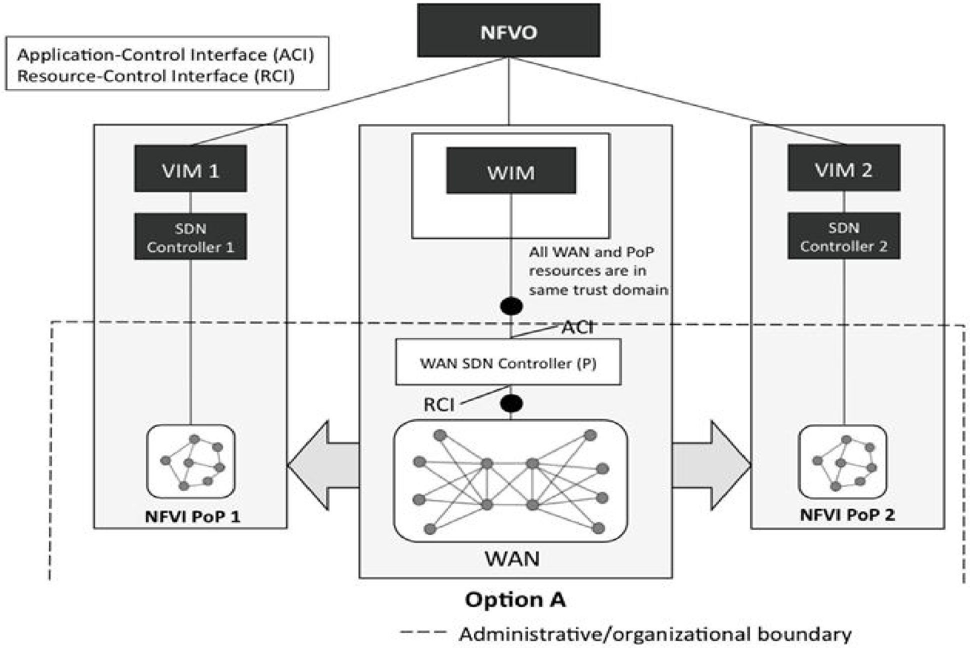


Inter VIM SDN - NFVI-PoP interconnection with pre-provisioned static pipe



- ⇒ Multi Site support discussed with OPNFV and OpenDaylight (i.e. multiple instances of SDN controller under the VIM)
- ⇒ REC#13 - further study to clarify the exact location of an SDN controller in the NFVI according to NFV-INF architecture building blocks

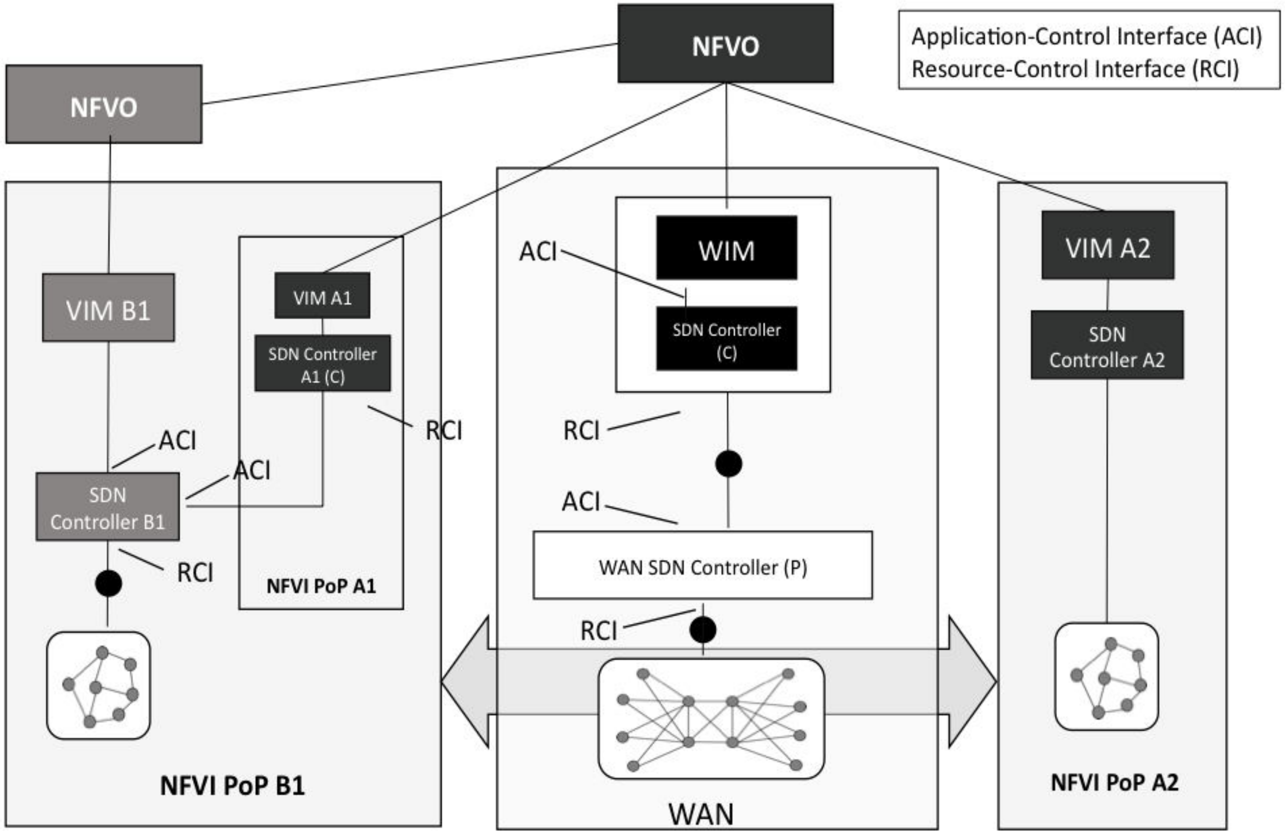
Inter VIM with 'on demand' NaaS WAN


NFVO
Application-Control Interface (ACI)
Resource-Control Interface (RCI)
VIM 1
SDN Controller 1
NFVI PoP 1
WIM
All WAN and PoP resources are in same trust domain
ACI
WAN SDN Controller (P)
RCI
WAN
VIM 2
SDN Controller 2
NFVI PoP 2
Option A
Administrative/organizational boundary

The connectivity service provided by the WAN domain could be either L2-based (e.g. following service models defined by the MEF – Ethernet Virtual Private Line, Ethernet Virtual Private LAN, Ethernet Virtual Tree [7]), or L3-based (e.g. IP/MPLS VPN).

=> REC#9 – it is recommended to further study & clarify how VIMs might request connectivity to the WAN domain in case of interconnected VIMs via WAN

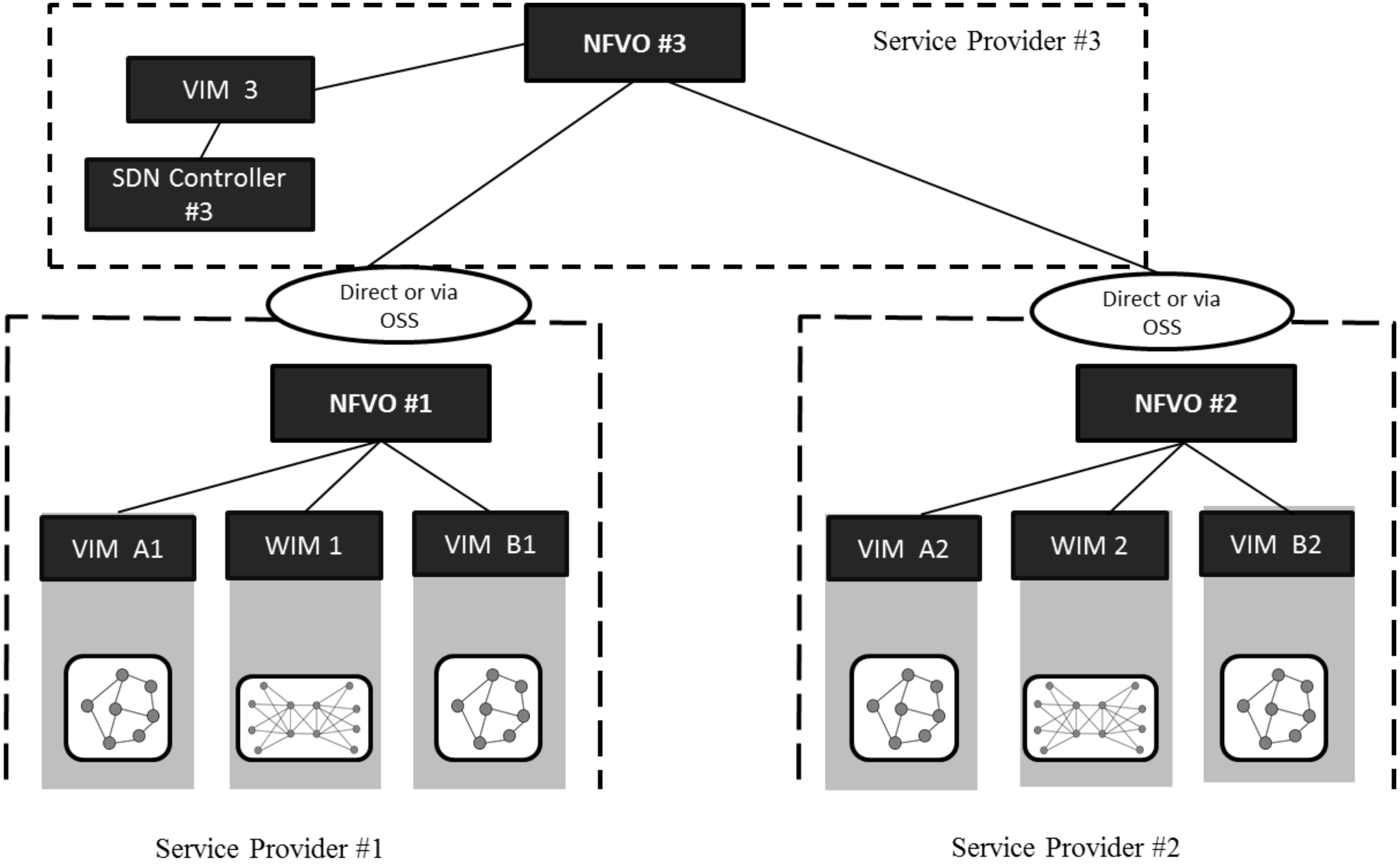
Multiple Trust Domains



NFVI and MANO Functions run in Virtual Environment (Virtual PoP) within NFVI-PoP of Other Trust Domain

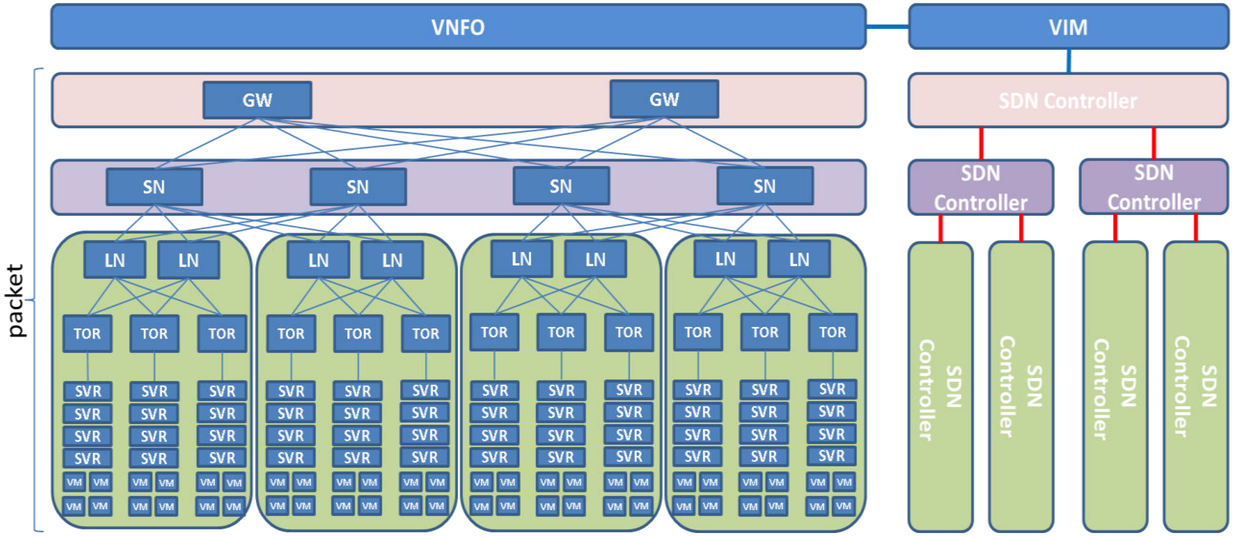
=> REC-SEC#3 - a requirement be specified to mitigate attacks via the SDN Controller's Application Control Interface.

Multiple Service Provider use case



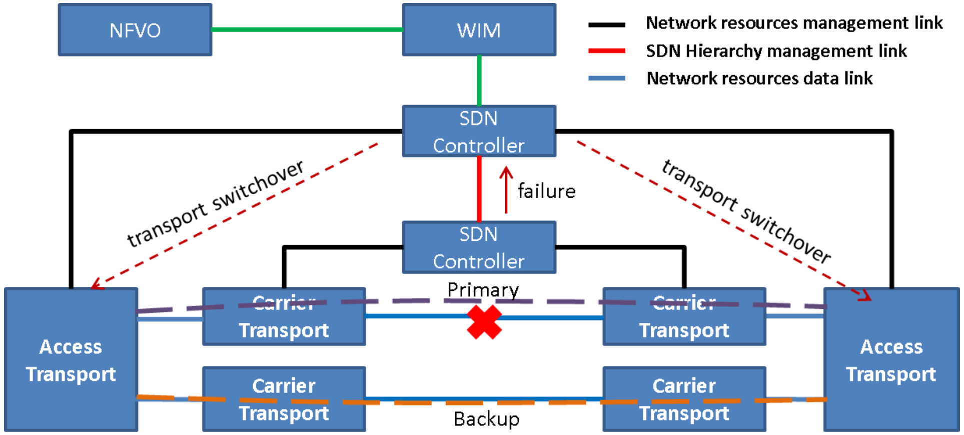
=> REC#18 - further study the interface between NFV MANO and the SDN controller to address some of the SDN controller request such as monetary cost and delay for instance.

SDN controller hierarchy

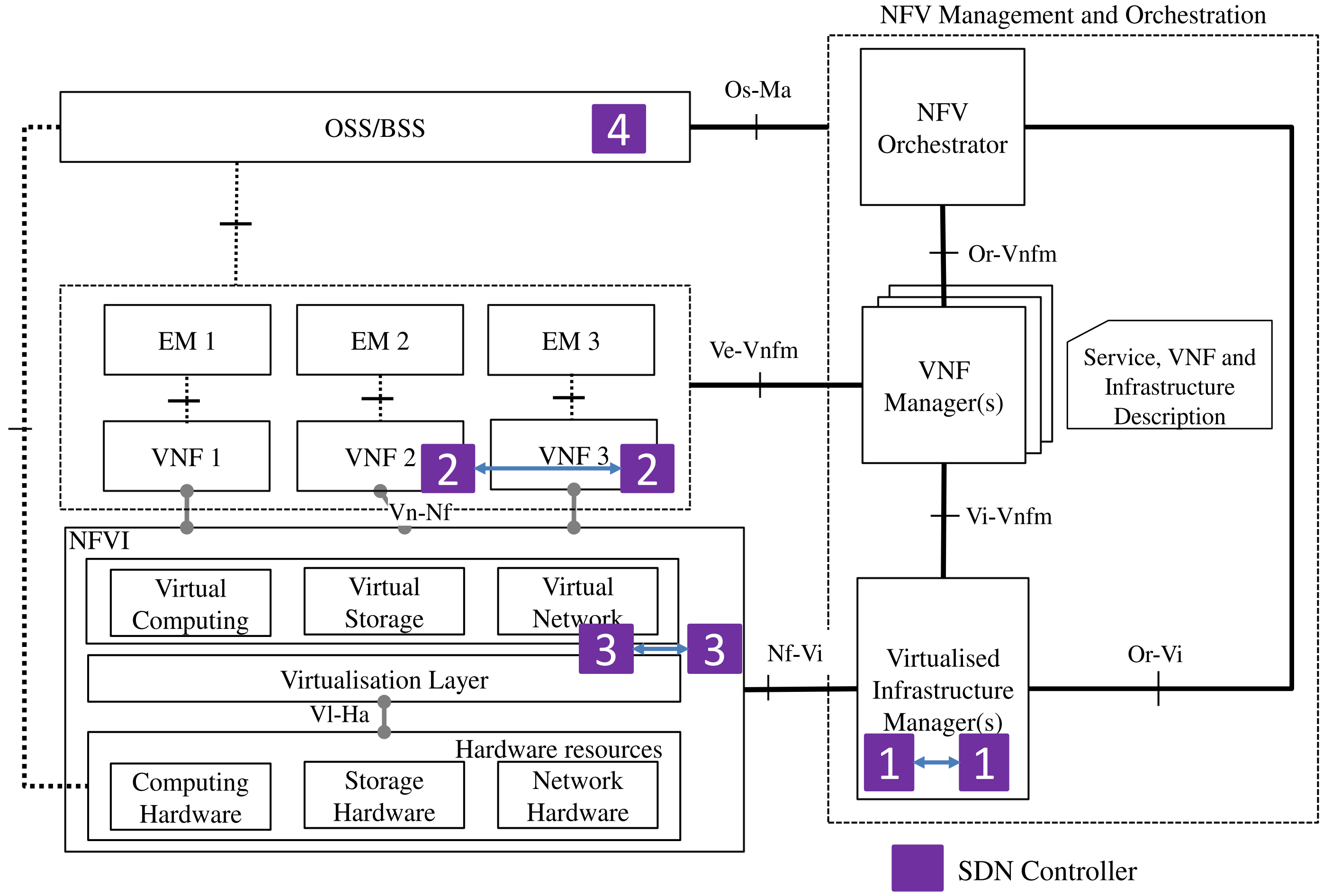


Typical Data Center

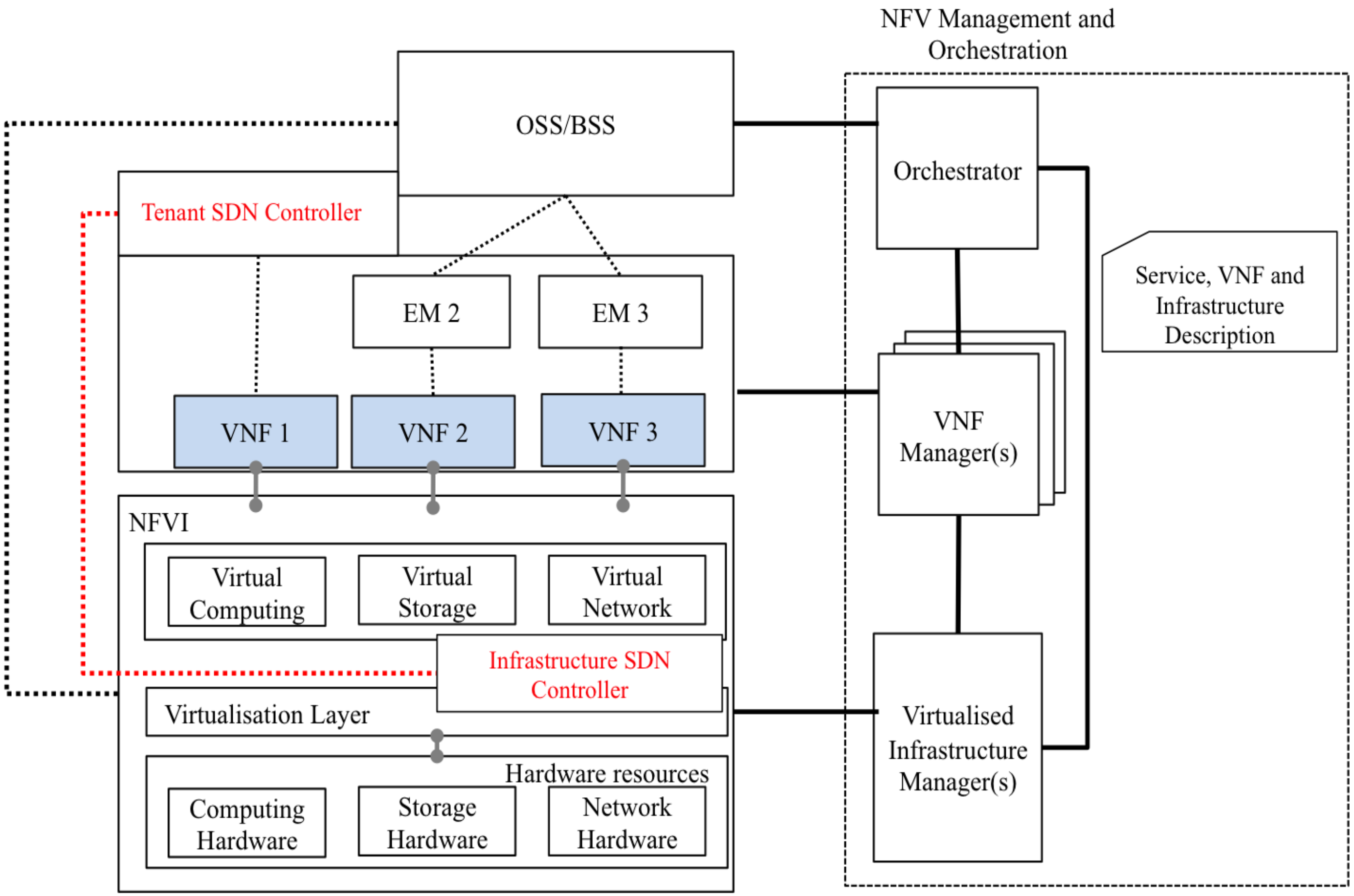
Failure & Switchover Use case



SDN Controller Federation

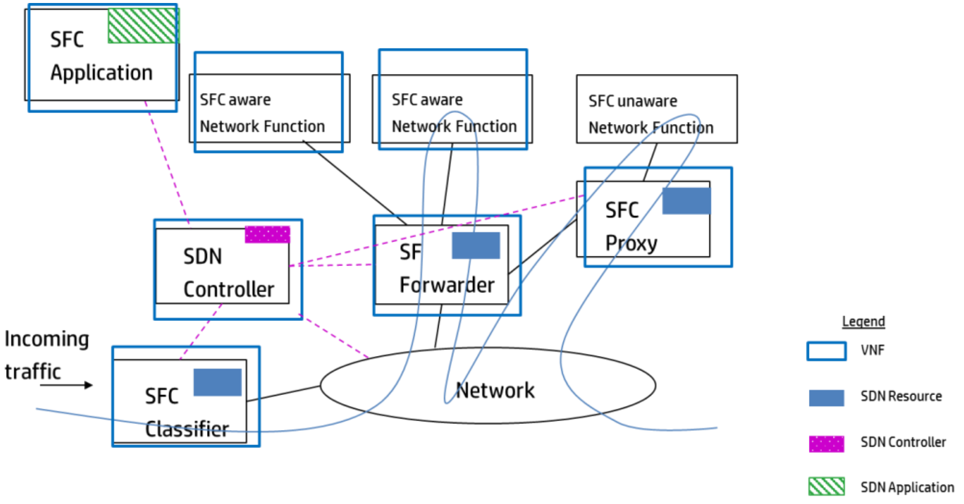


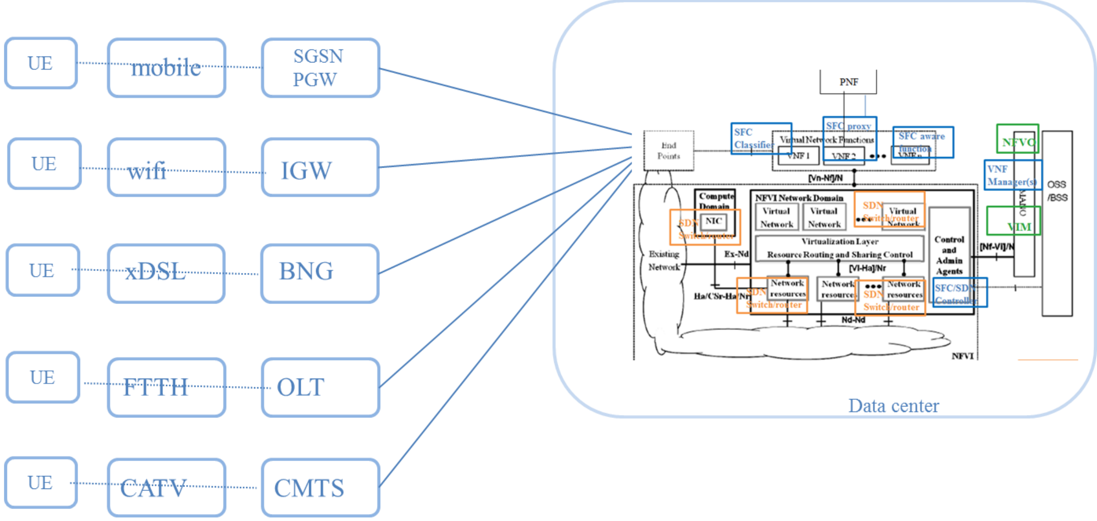
Tenant vs Infrastructure SDN controller



=> REC#7 – it is recommended to further study the interactions and interface between a tenant SDN controller and an infrastructure SDN controller

Service Function Chaining with SDN & NFV





ETSI NFV POC with SDN – Some at SDN WC !

14 ETSI NFV POC with SDN	SDN NE	SDN Controller	Comment
POC#1 - Open NFV Framework Project			
POC#2 - Service Chaining for NW function selection in Carrier Networks	OpenFlow	RYU	
POC#8 - Automated Network Orchestration	OpenFlow	OpenDaylight	
POC#13 - Multi-Layered Traffic Steering for Gi-Lan	OpenFlow	Vendor SDN controller	
POC#14 - Forces applicability for NFV and integrated SDN	Forces		
POC#15 - Subscriber Aware Sgi/Gi-lan virtualisation	OpenFlow	OpenDaylight	
POC#16 - NFVIaaS with Secure SDN-controlled WAN Gateway	OF 1.3	RYU	
POC#21 - Network intensive and compute intensive hardware acceleration	OpenFlow	Floodlight (POF)	
POC#23 - E2E orchestration of Virtualised LTE Core-Network functions	OpenFlow	Proprietary controller	
POC#26 - Virtual EPC with SDN functions in Mobile Backhaul Networks	OpenFlow	Ryu	
POC#27 - VoLTE Service based on vEPC and vIMS architecture	OpenFlow, OF-epc		
POC#28 - SDN Controlled VNF Forwarding graph	OpenFlow	Vendor SDN controller	
POC#34 - SDN-enabled Virtual EPC Gateway	OpenFlow	OpenDaylight	With extensions for GTP
POC#38 - Full ISO-7 layer stack fulfilment, activation and orchestration of VNFs in carrier networks	OpenFlow	Vendor SDN controller	

35 Recommendations (1)

REC#1 - enable a given SDN controller to always be able to communicate with its associated SDN resources	REC#13 - further study to clarify the exact location of an SDN controller in the NFVI according to NFV-INF architecture building blocks
REC#2 - support SDN controller being a PNF	REC#14 - further study the NS lifecycle management request coming from SDN controller to the NFV Management & Orchestration
REC#3 - further study NFV management with SDN control & Docker container based VNF	REC#15 - further study the access or synchronization of NFV MANO repositories with SDN repositories, i.e. for VNF instance repository.
REC#4 - further study the controller-controller interfaces	REC#16 - further study the case where traffic steering or some capacity issue triggers actions and has to choose between rerouting traffic, i.e. asking SDN controller to reroute traffic, or scale resources, VNF or NS.
REC#5 - further study the impact of intent-enabled interfaces on the NFV technologies.	REC#17 - requirement be specified for the interface between relevant MANO functional entities and SDN controller to provide low latency
REC#6 - assess whether to support an SDN controller orchestration interface between the NFVO and an SDN controller	REC#18 - further study the interface between NFV MANO and the SDN controller to address some of the SDN controller request such as monetary cost and delay for instance.
REC#7 - further study on the interactions and interface between a tenant SDN controller and an infrastructure SDN controller	REC#19 - further study policy management between NFV MANO and SDN controller.
REC#8 - WAN domain capabilities and connectivity end points requirements be specified when one or more WAN domains are involved via WIM	REC#20 - further study the coordination of concurrent claims coming from SDN controller or NFV-MANO to shared resources in an NFV environment
REC#9 - further study to clarify how VIMs might request connectivity to the WAN domain in case of interconnected VIMs via WAN	REC#21 - requirement be specified for the NFV-MANO to ensure that administrative domain(s) are provided with enough information to ensure that the proper network connectivity role is performed by the SDN controller(s)
REC#10 - further study on how VIMs might request direct connectivity across the WAN domain.	REC#22 - requirement be specified for the Nf-Vi interface to support operations going to an SDN controller.
REC#11 - further study to analyse the relationship between each NFVI-PoP and the respective WAN domains/providers , in particular with regards of the role of the NFVO	REC#23 - further study the requirements for interworking between multiple administrative domains using NFV and SDN, including ordering, charging, and inter-administrative domain security requirements.
REC#12 - further study direct access from a VNF to the NFVO to evaluate if a new interface is needed between VNF and NFVO	REC#24 - requirement be specified to transfer the ownership of resources from a management plane (or control plane) to SDN control (and vice versa).

35 Recommendations (2)

REC#25 - requirement be specified for the infrastructure resources and the NFV environment need to stay in place throughout any control transfer or control update process	REC-SEC#1 - requirement be specified to prevent attacks mounted via the Forwarding Plane against SDN switches and controllers
REC#26 - requirement be specified for control transfer process not to cause any disruption of user traffic	REC-SEC#2 - requirement be specified to mitigate attacks from the control network
REC#27 - requirement be specified for no alarms to be generated towards the end users during control transfers.	REC-SEC#3 - a requirement be specified to mitigate attacks via the SDN Controller's Application Control Interface.
REC#28 - requirement be specified to assure that the control state of the service path is synchronized across the resources before the control conversion is considered complete	REC-SEC#4 - requirement be specified to mitigate attacks against controllers and switches via the virtualised environment.
REC#29 - requirement be specified to be possible to segment a service path/resources under different control domains (co-existence)	
REC#30 - requirement be specified to be possible for a transfer from one control entity to another to fail in a non-destructive way, leaving the ownership unchanged and without impacting traffic.	
REC#31 - requirement be specified to support security and policy mechanism that would prevent from malicious intervention during transfer of control from management plane to SDN control.	

Interactions with the Ecosystem

ONF OPEN NETWORKING FOUNDATION

OPNFV

OPENDAYLIGHT

atis

THANK YOU

Draft available on the ETSI Portal

http://docbox.etsi.org/ISG/NFV/Open/Drafts/EVE005_SDN_usage_in_NFV_Report/NFV-EVE005v020.zip