



NFV-MANO #1

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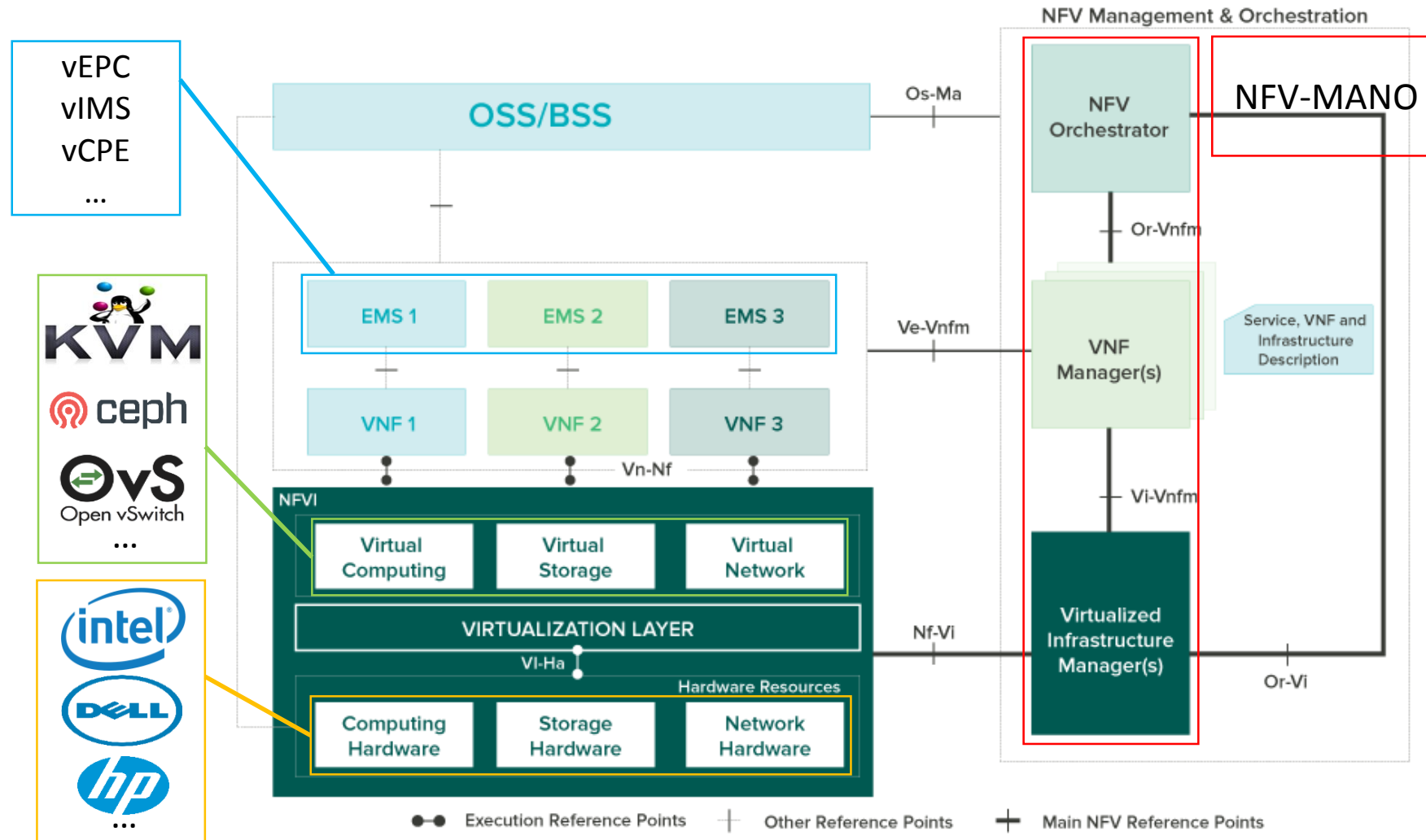
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- ❖ Introduction
- ❖ Summary of NFVO and VNFM
- ❖ Open Source NFVO and VNFM
 - OpenStack Tacker and HEAT
 - Open Source MANO
 - Open Baton
 - Others
- ❖ References
- ❖ Appendix
 - TOSCA
 - VNFD

Introduction (1/2)

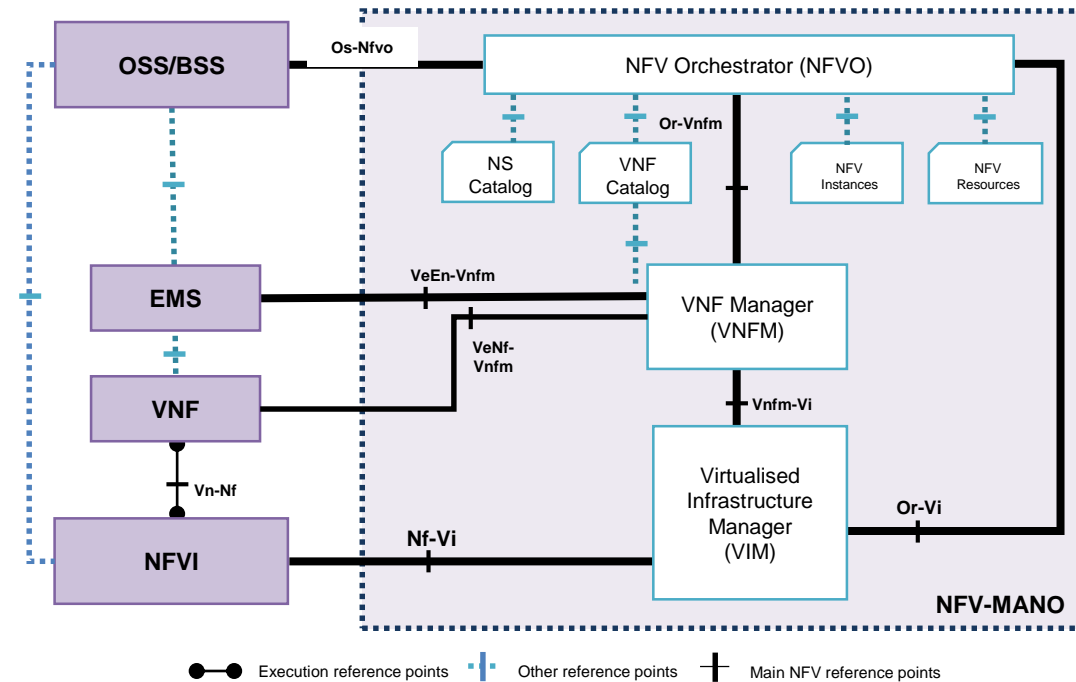
❖ NFV Reference Architecture



Source: The NFV-MANO architectural framework with reference points

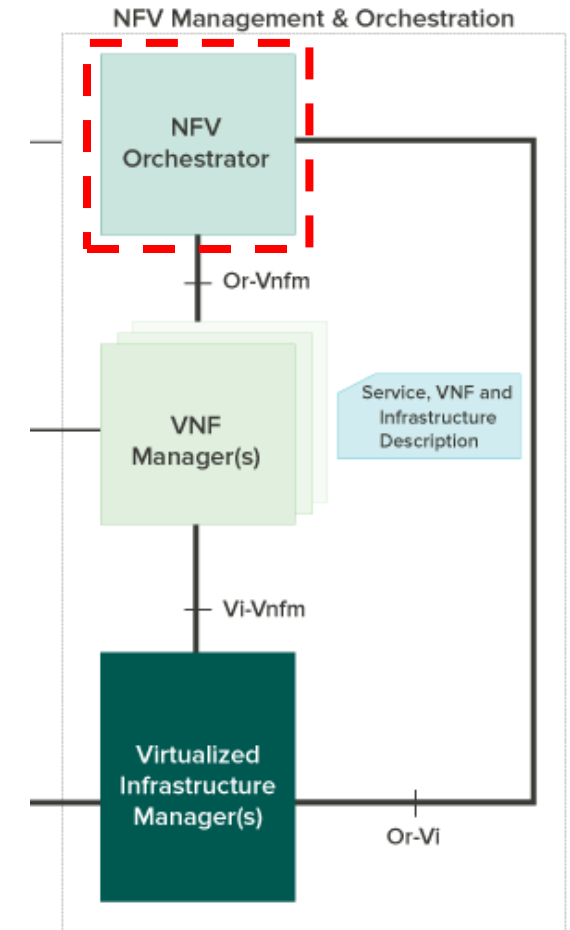
❖ NFV-MANO

- Network components (VNF) can be deployed in hours rather than months
- NFV Orchestrator (NFVO)
 - VNF lifecycle / global resource management, validation and authorization of NFVI resource requests
- VNF Manager (VNFM)
 - Coordination and authorization role of configuration and event reporting b/w NFVI and EMS
- Virtualized Infrastructure Manager (VIM)
 - Control and management of NFVI compute, storage and network resources



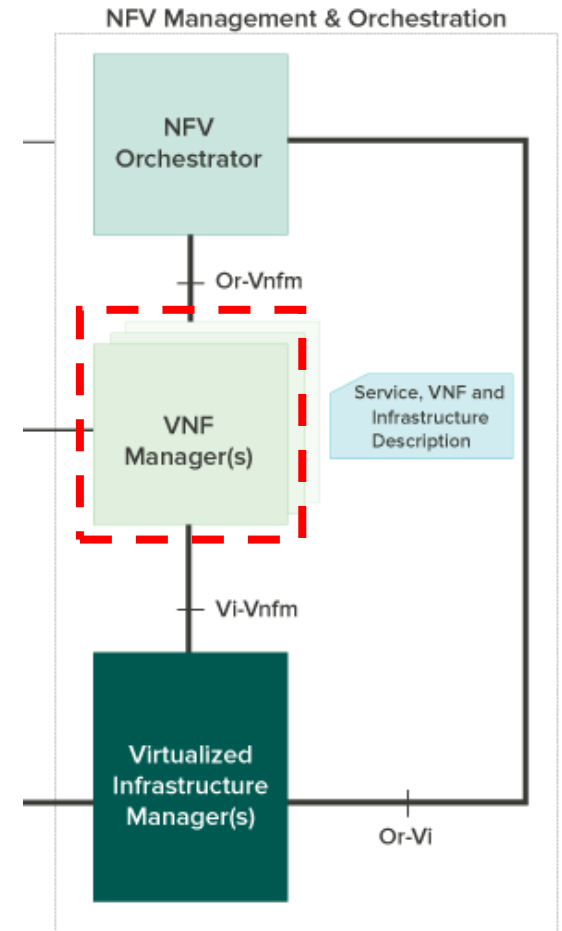
❖ NFV Orchestrator (NFVO)

- Network service orchestration using a collection of VNFs and Forwarding Graphs
- Templatizes an end-to-end Network Service using decomposed VNFs
- Resource Checks and Resource Allocation
- VNFs connected using Forwarding Graphs
 - Described in a VNF Forwarding Graphs Descriptor
 - Render VNF Forwarding Graph using SDN Controller or a SFC API
- Ability to orchestrate VNFs across multiple VIMs
- Examples
 - OpenStack Tacker, Open Source MANO, OpenBaton, Open-O, etc.



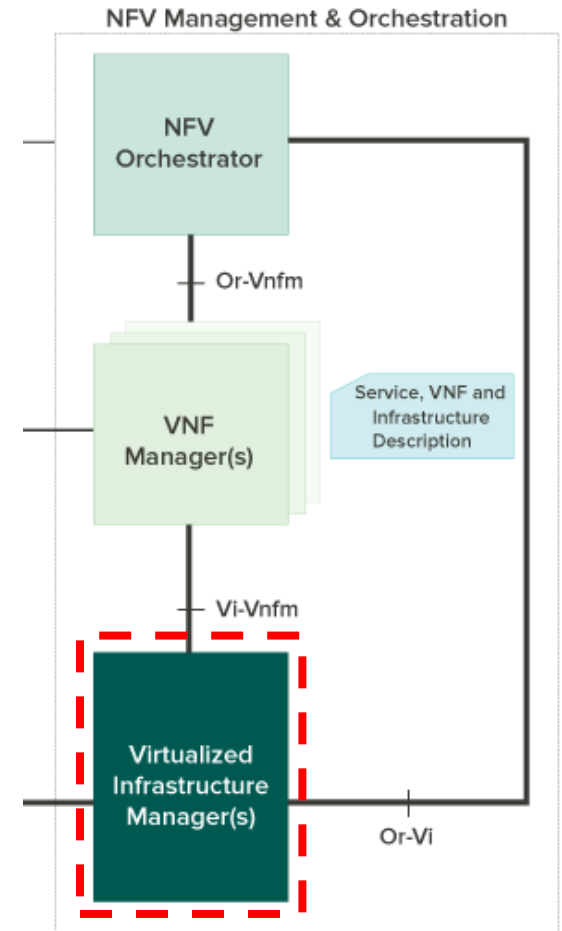
❖ VNF Manager (VNFM)

- VNF Catalog
 - Repository of VNF descriptors (VNFDs) in a database
- VNF instantiation and termination
- VNF monitoring – health and performance indicators
- Self healing and auto scaling
- VNF configuration injection during instantiation
- VNF image management
- Support both simple and complex VNFs
- Examples
 - OpenStack Tacker, Open Source MANO, OpenBaton, Open-O, etc.



❖ Virtual Infra Manager (VIM)

- Responsible for controlling and managing the NFVI compute, storage and network resources
- Usually within one operator's Infra Domain
- Exposes Northbound APIs (used by VNFM)
- Operations
 - Keeps an inventory of the allocation of virtual resources to physical resources
 - Supports the management of VNF forwarding graphs by organizing virtual links, networks, subnets, ports, and security groups (e.g., ACL)
 - Manages a repository of NFVI hardware resource and software resources
 - Collects performance and fault information via notifications
 - Manages software images (add, delete, update, query)
- Examples
 - OpenStack, CloudStack, VMware, AWS, etc.



❖ Functional Blocks

