

Management and Operations of Networks, Services, and Systems

Network Function Virtualization

Ricardo Morla

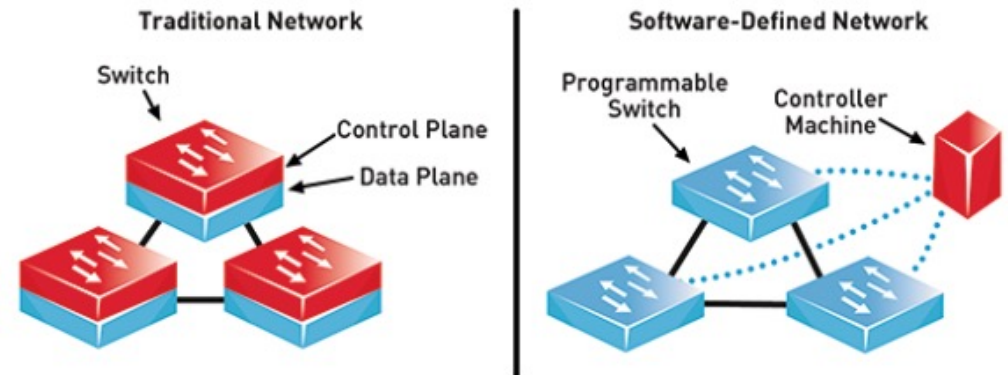
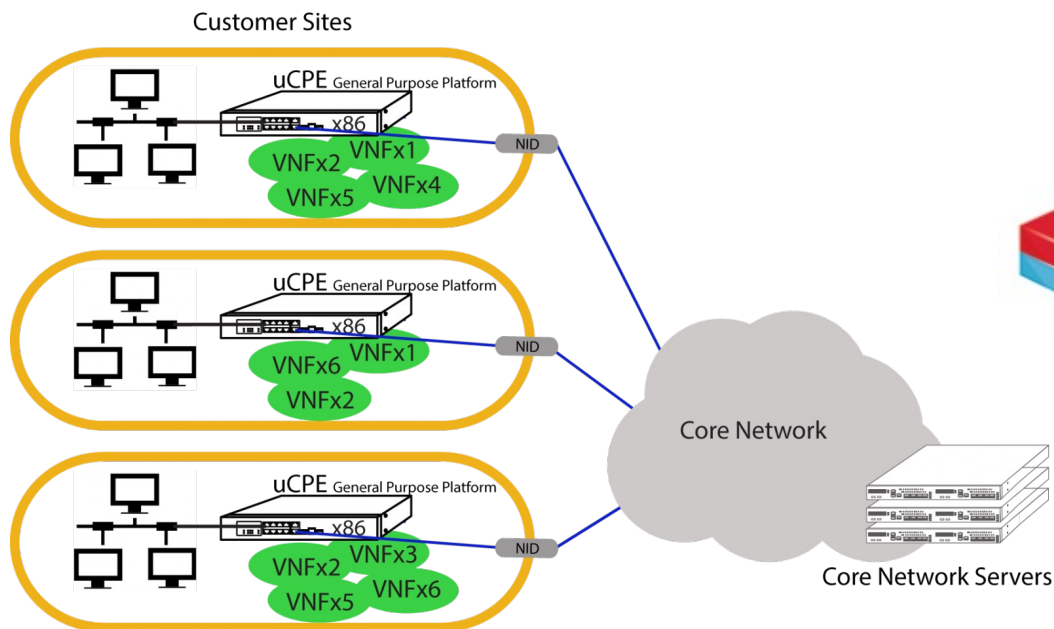
FEUP – GORS/M.EEC, GRS/M.EIC

NFV vs. VNF vs. etc

- Network function virtualization – the concept
- Virtual network function – the network function that is being virtualized
- SDN – not related really
- Network virtualization – can be enabled with SDN or with VLANs etc
- Go and check the SDN content

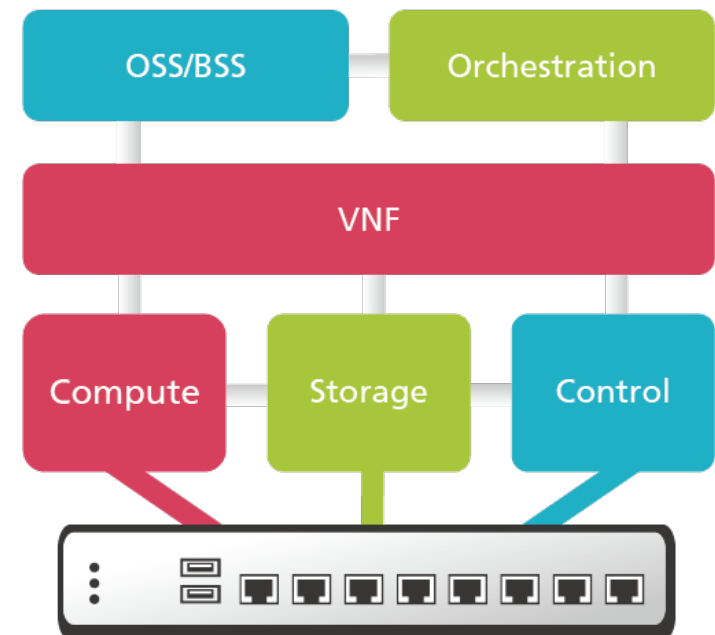
SD-LAN – NFVs and SDN on a LAN

Remote uCPE Architecture



uCPE – customer-premisses white box

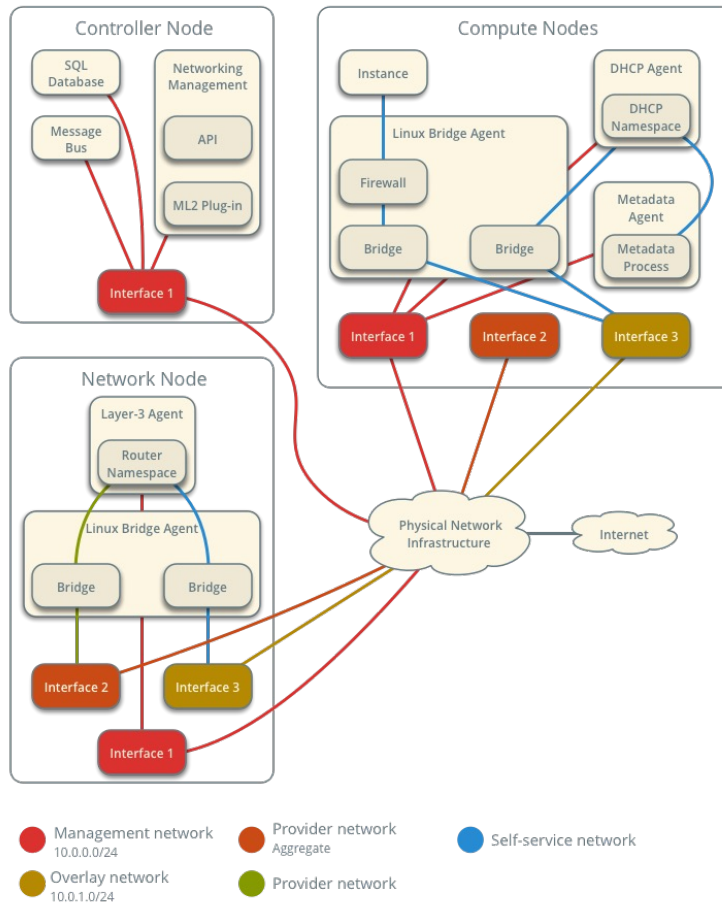
- Runs VNFs as VMs or containers
 - DHCP
 - Routing
 - NAT
 - Whatever you like



Datacenter – Openstack networking

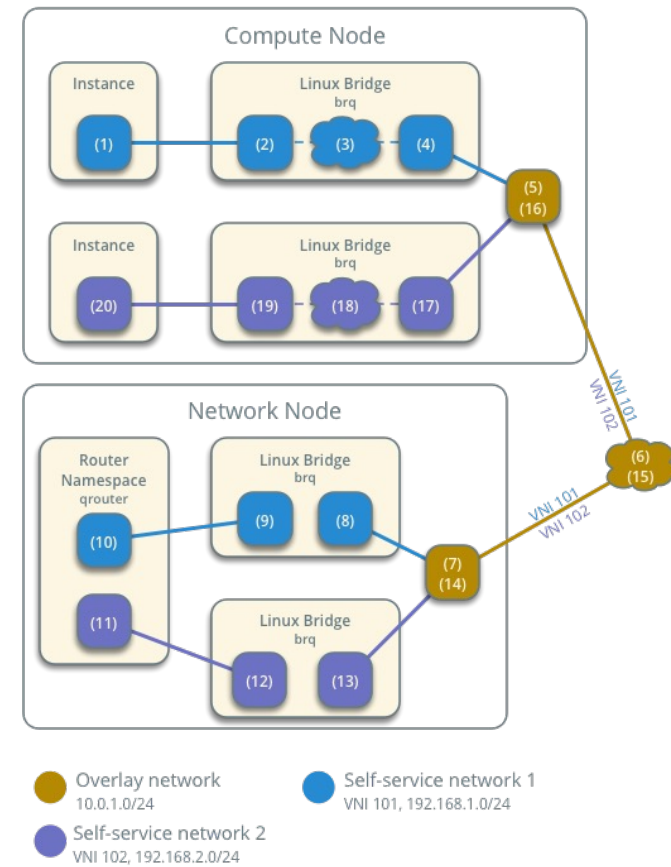
Linux Bridge - Self-service Networks

Overview



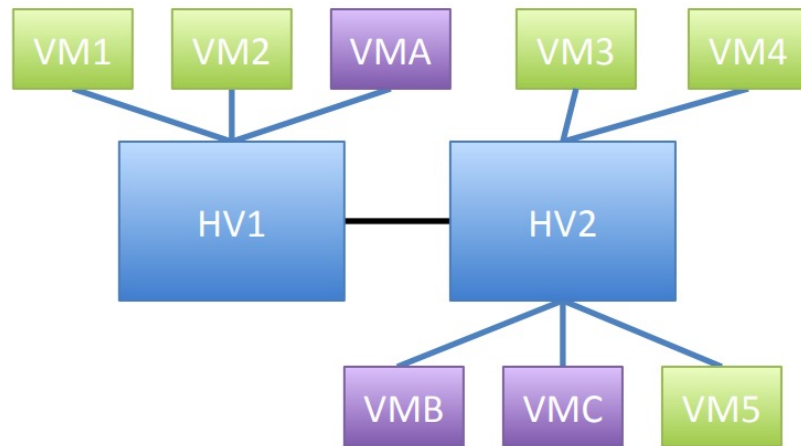
Linux Bridge - Self-service Networks

Network Traffic Flow - East/West Scenario 2

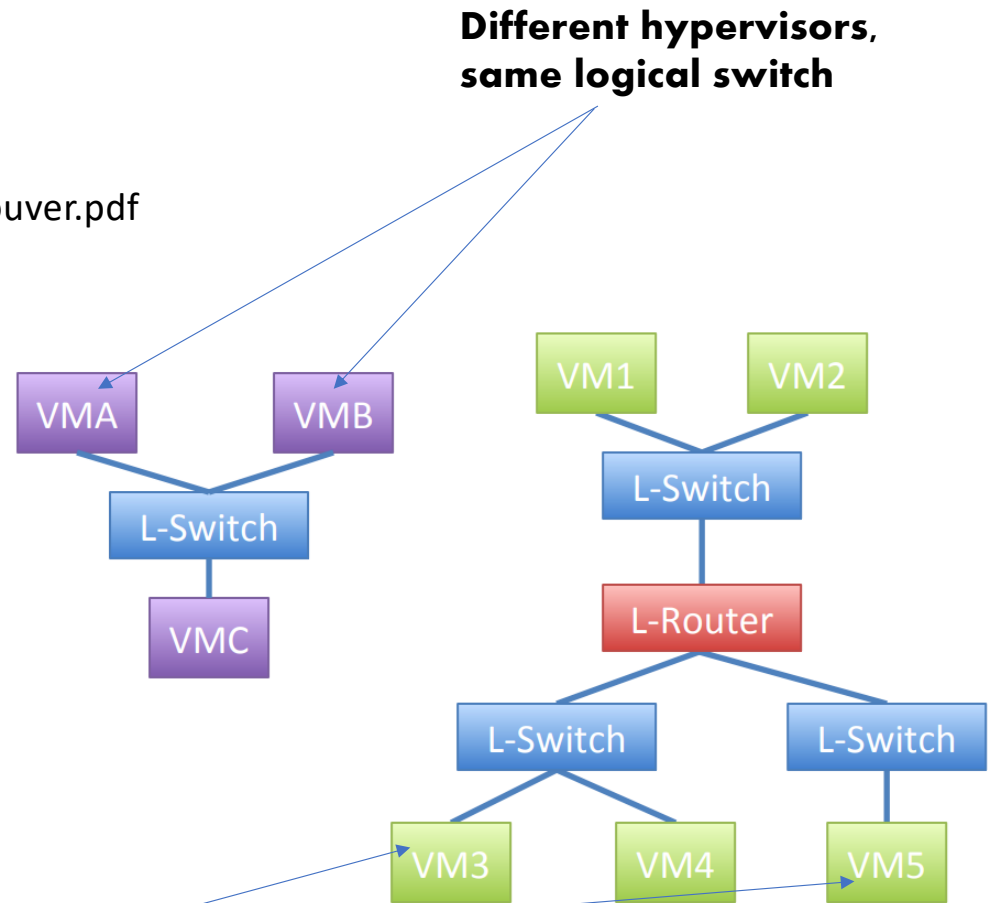


ovn.org

<http://www.openvswitch.org/support/slides/OVN-Vancouver.pdf>



Physical



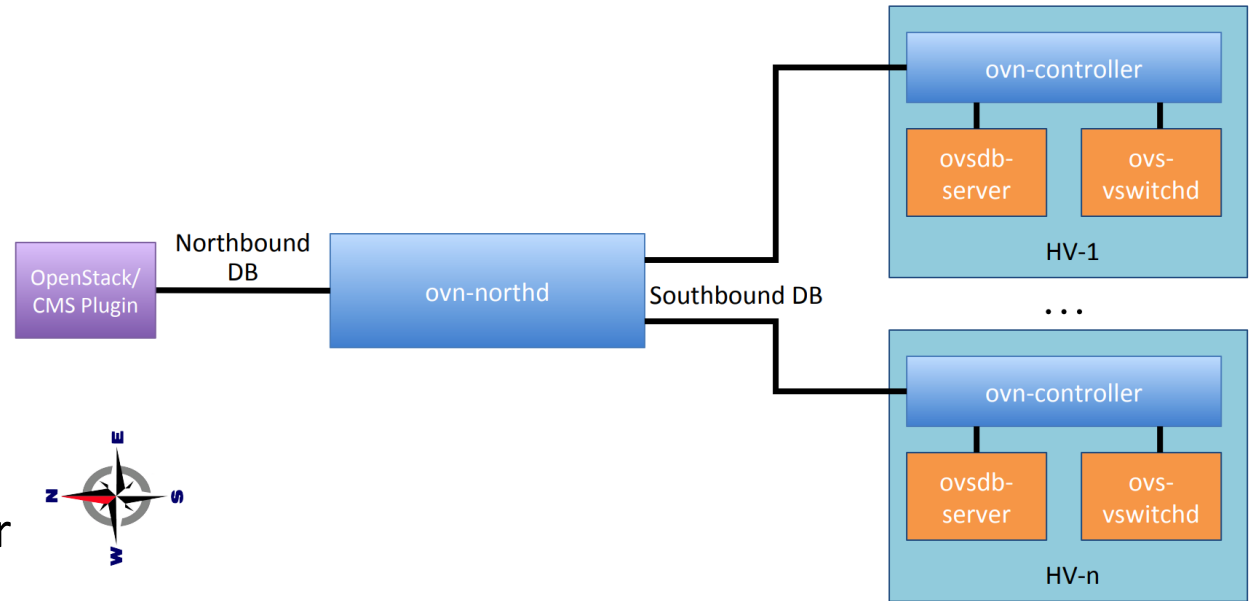
**Different hypervisors,
same logical switch**

**Same hypervisor,
different layer 3 net**

Logical

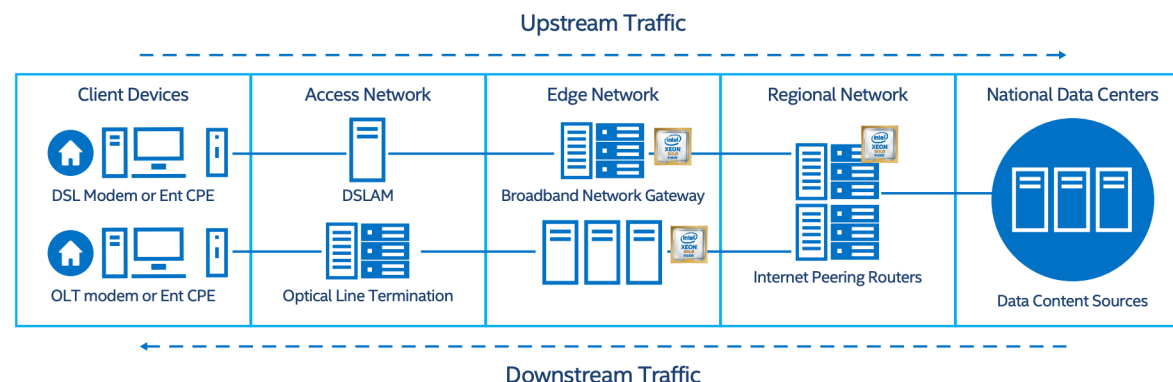
ovn.org

- SDN switch
 - ovs-openvswitch
 - Others, hardware
- OVN switch controller
 - For each switch/hypervisor
- OVN northbound API
 - To talk to openstack and other management systems
 - High-level, intended state
- OVN southbound API
 - To translate high-level state to low-level openflow commands and ports

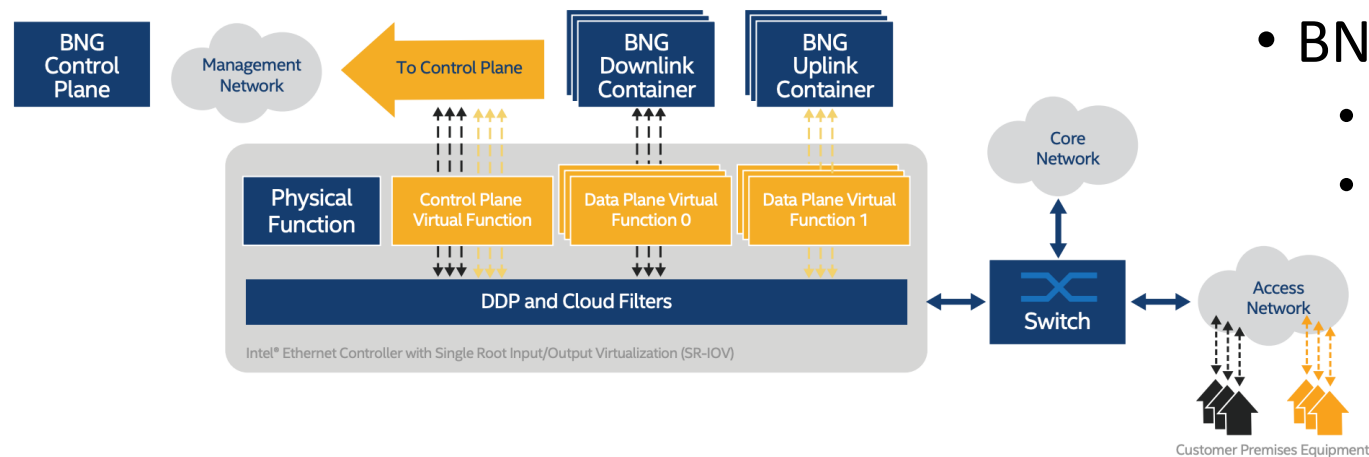


Virtual Broadband Network Gateway

<https://www.intel.com/content/dam/www/public/us/en/documents/platform-briefs/broadband-network-gateway-architecture-study.pdf>



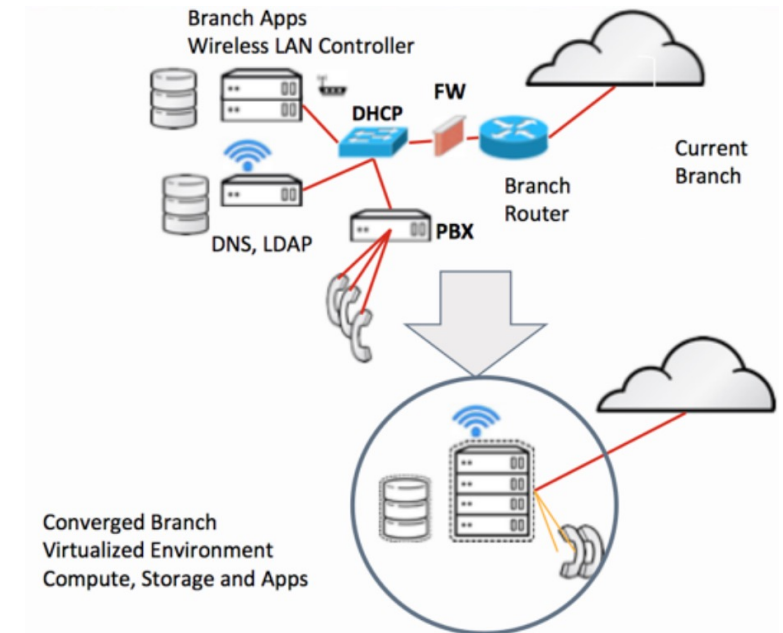
- CPE 2 BNG infrastr.
 - No SDN
 - Point-to-Point Protocol PPPoE
 - Unique session id per subscriber
- BNG infrastr. 2 vBNG
 - PPPoE profile
 - Data / Control plane separation



Virtualized Central Office

<https://www.opnfv.org/>

- CPE (customer-premises equipment)
 - An SDN / NFV switch
- Thin CPE:
 - all services are provided from the VCO
 - network interface device (NID) to terminate connections at the enterprise site
- Thick CPE:
 - Switch + compute node at the enterprise site
 - runs localized applications and services (VM/containers)

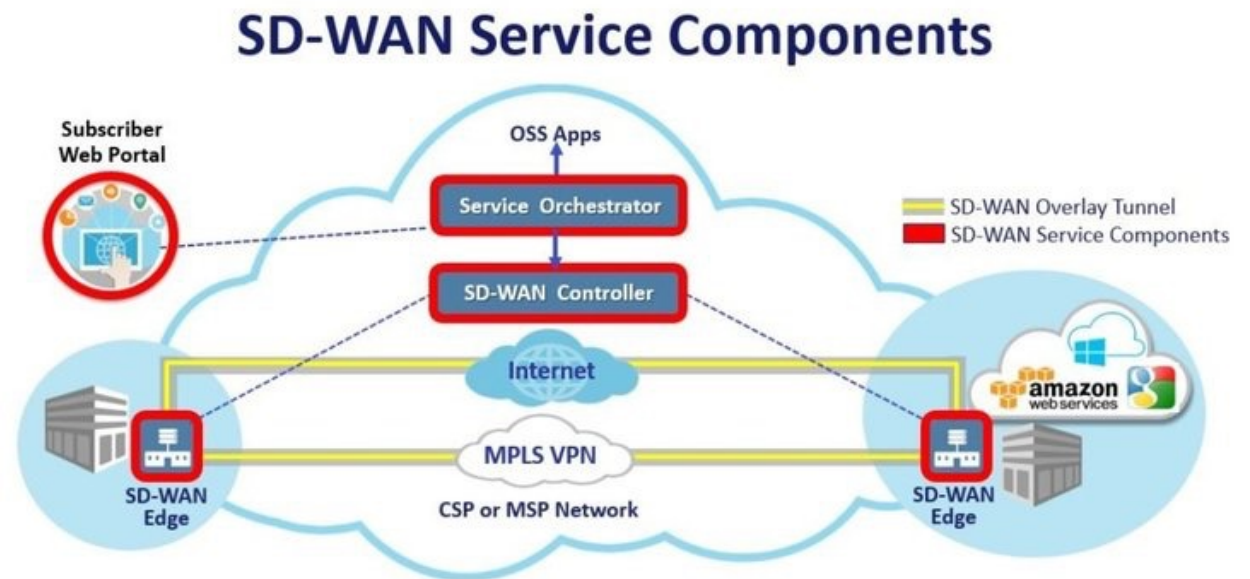


https://www.opnfv.org/wp-content/uploads/sites/12/2017/09/OPNFV_VCO_Oct17.pdf

SD-WAN

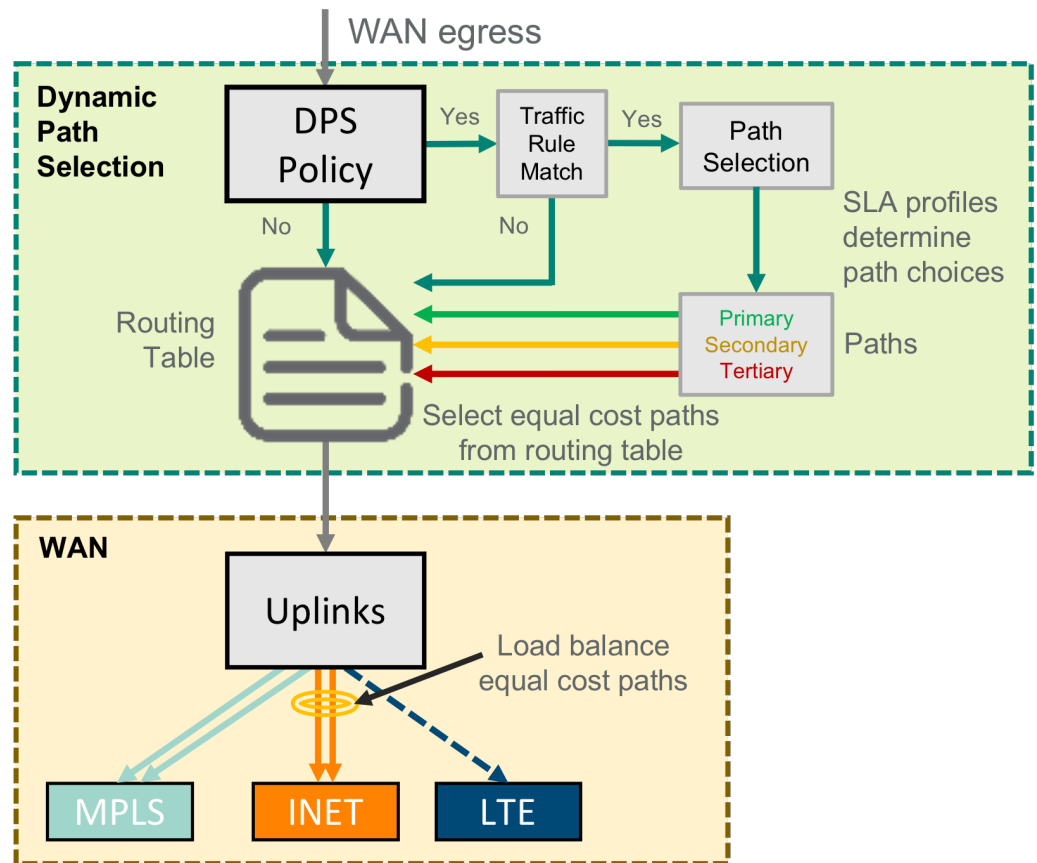
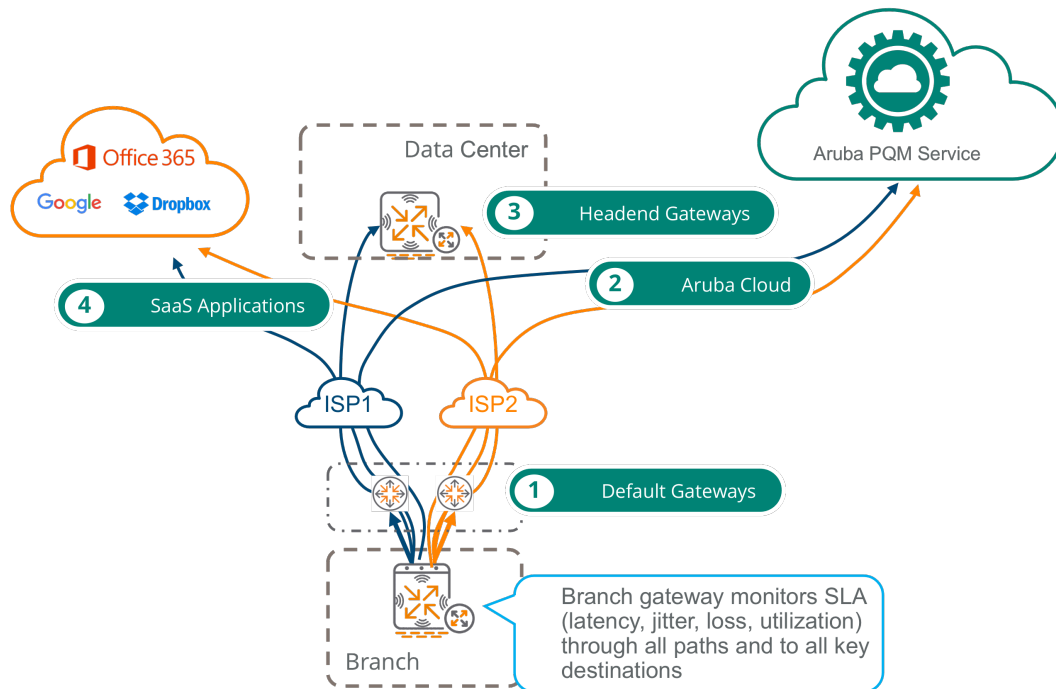
<https://www.sdxcentral.com/networking/sd-wan/definitions/software-defined-sdn-wan/>

- SD-WAN edge
 - Universal customer-premises equipment uCPE
 - Runs NFVs for SD-WAN, e.g. tunneling, QoS, security, etc
- SD-WAN controller and orchestrator
 - Controls network flows and NFVs



SD-WAN dynamic egress selection

<https://www.arubanetworks.com/techdocs/VSG/docs/070-sd-branch-design/esp-sd-branch-design-030-aruba-sd-wan/>



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