U-5 (SDN).

DOMS | Page No.
Date / /

* Definition of NFV-

- NFV (Network Function Virtualization) are replacement of network appliance hardware with virtual machines.
- NFV is a new way to design, deploy & manage networking services by decoupling physical network requirements from functions.
- By decoupling network functions from physical devices on they run, NFV has potential to lead to significant reductions is OPEX & CAPEX.
- i) Pay as you go
  ii) Fewer applicationces
  iii) Scalability.
- virtual appliances can be instantiated on demand w/o datacentres & w/o need of modyfying physical infrastructures.

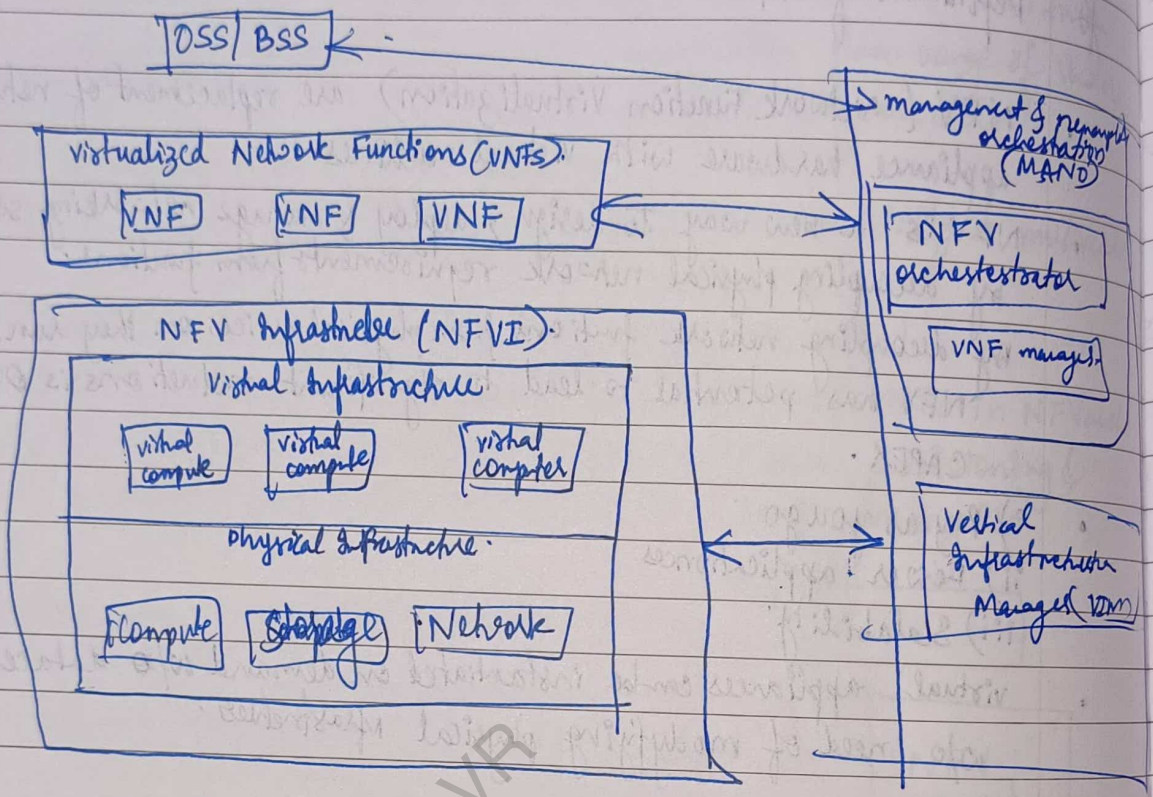
- Need of NFV-
  i) Virtualization.
  ii) Orchestration.
  iii) Programmable
  iv) Automation.
  v) Dynamic Scaling
  vi) visibility.
  vii) Performance
  viii) Multi-enances.
  ix) servic integration
  x) open fees choice of modular plugins.

- Benefits-
  i) cost Savings
  ii) Scalability
  iii) Agility
  iv) efficiency
  v) Automation.

Q9 -

DOMS | Page No.
Date / /

* NFV architecture. Q8 -



consists of 3 main parts -

i) Centralized virtual network infrastructure
ii) compute code applications
iii) Framework (MANO).

RRs of NFV -

① physical security controls do not seem to be effective virtualizing will increase expose to attacks.
② Malware is tough isolate & contain.
③ Network traffic is smaller amount transparent
④ complex layers needs multiple kinds of security.

A

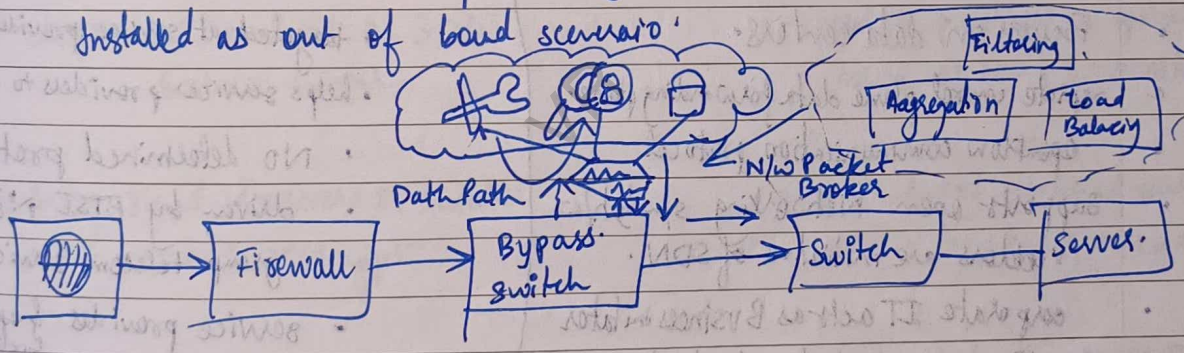
92

Inline Network Functions -

(1) Inline network device is a device that receives packet and forwards them to their intended destination.
eg → routers, switches, firewalls, for web application intrusion detection systems & prevention systems, anti malware & tap/n taps.

(2) Nature of out of band or in line surveillance scenario impacts.
i) placements of surveillance equipment
ii) type of surviellance device used.
iii) surviellance activites that can be performed as part of visibility.

(3) Firewall is typically placed on company main n/w interface to outside world. That is why they are in-line. But IDS (detection system) are not typically placed inline as it is used to used to scandals for intruders. It is not intended to inspect every packet that transverses n/w. Installed as out of band scenario.



Benefits of Network Function:

- Improved Communication
- Resource Sharing
- Scalability
- Flexibility
- Centeralized Management
- Security
- Vendor Independace
- Faster time to Market
- Reduced Environment Impact

24-8-2022

DOMS | Page No.
Date / /

* Challenges for Network Function Virtualization -

- Orchestration & Integration in Hybrid Networks
- Business cases (unrealistic idea, cost reduced (vendor lock in, s/w complexity, preparation, operational simplicities), customer experience, full access, dynamic)
- Lack of capabilities (reduction of OPEX, more s/w centered)
- organizational Issue (absence of gov,
- Lack of standards (small impedence, help innovative, fast paced cycle).
- Management & orchestration issues (resource needs fluctuate, short duration, flexibility resources)
- Security & Privacy (open interface, remote attestation, account management)

Q4

SDN	NFV
• Focuses on data centers.	• targeted at service providers & operators
• seprate control plane data forwarding plane.	• helps service providers to virtually function
• openflow communication protocol	• No determined protocol
• supports open Networking s/w & h/w vendors are initiative of SDN.	• driven by ETSI NFV work group telecom service providers
• corporate IT acts as Business initator	• service provides & operators are business initiators
• Appl^n seen on industry standard servers	• runs on industry standard servers
• Reduces cost of network.	• Increases scalability & agility

Q5

NFV	NV.
① Architecture is centered around data centers.	① primarily meant for service providers & operators
② offers key components of complete network, including its infrastructure & available app^ns.	② offers broad range of specialization capabilities that need to be carried out all levels of N/w
③ NFV adds virtual functions to physical n/w	③ NV adds tunnels to physical network

* NFV is NV on electricity
* NFV consists NF like network address transaction, firewalls, IDS.
* NV is a use case, a service that can be arranged, where diff N/w uses each a topology.
* VNF can utilise multiple VMs to acheive its functionalities each individual VMs are known as VNF components.

Q6 -

NFV	NV
• architecture is centered on datacenters	• meant for service providers & operators.
• NFV separates control plane & data forwarding plane.	• enables service provider or operators to virtualize operation.
• SDN isolates control plane from data	• Enables service providers or operators to virtualize operation dedicated equip to virtual servers.
• communication protocol, NFV employs OpenFlow	• No protocol has yet been established
• supported by manufacturers of gear & software for business networking	• operators or telecom service.
• cooperate IT services as SDN Business initiator	• service providers or operator serve as NFV business initiator
• Industry standard servers & switches used to created SDN appln	• On industry-standard servers NFV appln are executed
• SDN reduces network expenses further by doing away with requirement for pricey switches & routers	• Hardware capacity to network services that are needed at any given time.

NFV Usecase

- security Upgrade
- cost-effectiveness.
- scalability.
- Load Balancing
- Website Performance
- Resource Utilization.

Q10 -

DOMS | Page No.
Date / /

Reading NFV vendors-

1) Juniper Networks, Inc—
- Helps clients create scalable, dependable, secure & affordable n/w by designing, developing & distributing high-performance when soln assistance.
- Two divisons - Products & services.
  VPNs, service control gateways, orchestration & automation of VNF.
- Americas, Asia Pacific, Middle East & Africa.
- Subsidaries - Mist System, Inc, AppFormix Inc & Anellion Inc (US)

2) Ericsson —
- Top ICT supplies to services provides.
- Offers N/w assistance pioneer in 4G & 5G tech-
- Busines segments - N/w management, digital services, managed services
- amelia, Asia Pacific, ME, Afeica.
- Subsidaries Lean Inc, Ericson - (south korea), Ericsson - Tesla (Croatia) US

3) CISCO systems, Inc.
- Internet is powered by wide variety of tech that cisco systems creates 2 sch
- Intent based soln → security, collaboration, apps & cloud to give customers by by
- 4 divisons - Infrastructure platform, services, Appln, Security-
- operation across - Mof Africa, Europe, Asia, North America,
- Subsidaries - Broadsoft, Inc, open DNS, Cisco Webex Inc.

4) Hewelute Packard Enterprises.
- offers consumers, small & big business others, comprehensive age of hardware & relatea services.
- Range of NFV services like vulnerability research, data devices. security Enhancement & ongoing scrutinity maintain.
- MEA Africa, Asia Pacific, Latin America, NA & Europe
- Subsidaries - Voodoo Pg Apagee Corporation & Indigo Aeron.

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3) Fujistu. Ltd-
- Another top ICT firm, fujistu offers wide selection of goods, services
- 3 business segments: Ubiquitous & soln; Technology soln & Device soln.
- Wide variety of NFV soln, network, storage, computation & virtual envirg
- ME, Africa, Europe, Asia, NA.
- Subsidaries - Niffy Corporation, PFU Limited, FDF Corp, Rigun Kiak.

4) Affirmed Networks-
- 2010, Massachewelts, services to change & advance intelligence in mobile dt
- offers slicing, virtual probe & analytics & IOT virtualy & soln.
- virtualized DPI & optimized IOT access, wifi & service automation.
- NA, Europe, Asia-Pacific.

5) Huawei Technologies Co. Ltd-

① Leading ICT supplier
② 4 Business segments - carrier B, enterprises B, consumer B & others.
③ Provides services for NFV, including EC & IOT soln for intelligent computing
④ NA & europe, Asia Pacific, Me & Africa
⑤ Subsidaries - Huawei Device Co., Ltd, Heavi Machine CO. Ltd, Shangai Huawei Technologies, Co. Ltd.

Risks of NFV

- Physical security controls don't seem to be effective.
- Malware is tough to isolate & contain.
- Network traffic is smaller amount transparent
- Complex layers need multiple kinds of security

Q11-