Data Center - • building that uses a sophisticated network, computing &. storage infrastructure to give shared access to appl^n & data.

• physical location where computer systems are securely kept before being used to store & exchange data for client systems to process.

Data center Architecture → Key Design Components:
⤷ Servers
⤷ Storage Devices
⤷ Infrastructure for networks & communications
⤷ Security

Data Center Architecture Components:
⤷ Data Center Computing
⤷ Data Center storage
→ Data Center Networks.

Factors → Uptime
⤷ Investment
⤷ Redundancy
⤷ Fault Tolerance level:

. Data Centre Demands
⤷ Adding
⤷ Moving
⤷ Deleting Resources
⤷ Failure Recovery.
⤷ Multitenancy:

(V-3 (SDN))

* **Traffic Engineering**

necessary for appropriate distribute of network load as well as exploiting path diversity.

Challenges →

- Scale → many switches, hosts & virtual machines.
- Churn → Large no. of component failures / VM migration
- Traffic → high traffic vol & dense traffic matrix / volatile, unpredictable pattern
- Performance requirement → delay - sensitive appl^n / Resource isol^n b/w tenants

Opportunities →

- efficient network — Low propagation delay & high capacity
- specilized topology - Fat tree, clos network, etc / opportunites for hierarchical
- control over both network & hosts -
- Flexible movement of work load - VM migration

* **Tunneling methods are** -

1) Virtual extensible local area Network (VxLAN)
2) Network Virtualization using Generic Routing Encapsulation (NVGRE)
3) Stateless Transport Tunneling (STT).

1) Virtual eXtensible LAN:
   - VMware & Cisco → mitigate, inflexibility & limitations of networking technologies
- uses Mac In IP tunneling.
- tunnels are stateless.
- segment end points are switches perform encapsulation & called VTEPs.
- each virtual network or overlay is called VXLAN segment.
- VXLAN segments are identified by a 24 bit segment ID, allowing for up to 224 segments.
- UDP based & port no. for 4789 (VXLAN)

2) Network Virtulization using GRE. (NVGRE)
   - developed by Microsoft with Intel, Dell & HP.
   - GRE tunnels → stateless.
   - unicast between → two NVGRE end points → running on switch
   - utilizes MAC-in-IP tunneling.
   - virtual network or overlay is called virtual layer two network.
   - packets are unicast.

3) Stateless Transport Tunneling (STT)
   - utilizes Mac In IP tunelling.
   - virtual network exists → STT
   - context IDs are 64 bits.
   - attemps to acheive performance gains over NVGRE & VXLAN by leveraging TCP found in NICs of many servers.
   - packets are unicast b/w tunnel end points.
   - TCP synchronization & flow control.

SDN uses in Data Centers -
1] Network Virtualization 2] Network Automation & Orchestration
3] Dynamic Load Balancing 4] Traffic Engineering & QOS.
5] Reducing Security Rules 6] VM communication simplification 7] connecting Enterprise DC
8] Integrating legacy Networks 7] Wireless Networking.

☀ VLAN (Virtual local area network).—

virtualized link that unites various network nodes & devices from several LANs into single logical network.

Adv → saves cost
→ simplified administration.
→ enhanced security
→ offer greater security.

→ improved flexibility
→ simplified network managent
→ efficient resource utilization

☀ Ethernet VPN (EVPN).—

gives big businesses a standarized framework for controlling their campus & data centre networks.

Adv → simple to automate
→ backward & forwards compatibilty
→ Layer 2 & Layer 3 connection that is efficient & integrated.
→ simple network scalability depending on business.
→ get safely isolate traffic via netook segmentation inside & across
→ reduced fault domain improves network dependability.
→ MAC address mobility offers easy but flexible deployment
→ loop free technology spanning tree protocol
→ network bandwidth is entirely used by active-active redundant

→ scalability
→ seamless connectivity
→ efficient traffic forwarding.
→ simplified mgnt
→ Interpresolability

Q3.- SDN ~~advantages~~ strategies to centralize Management in data
center

- → Automated Network Provishing.
- → Traffic shaping
- → Real time Monitoring
- → Reducing security risks.

Q4 - SDN Use Cases in Data Centre
- → VM communication simplification
- → Connecting Enterprise data centers.
- → Integrating legacy networks.
- → Wireless Networking

Q5 ✱ Adding → adding new data centre in existing datacenter.

✱ Moving →. asself from one data centre environment to another
- . migrating one or more appln from one computing environment → data centre migration
     to another is reffered → appln migration

- . Moving particular collection of data from one storage system
     to another → data migration.

✱ Deleting → Removes a data center
- → only remove a datacenter when no properties or resources are
                                                        assigned to it.

✱ Failure → company area's continuity planning procedure should be
  recovery   integrated with Failure recovery plan.

✱ Multitenancy — businesses can rent space to host their data.

Q6 - Data Center Architecture components
- → Servers
- → storage.
- → Infrastrucur for network s.f communication.
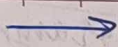- → Security.

Q9 4 tiers of data centers : ⟶ Uptime 1) Basic
2) Redundancy Capable
3) Concurrently maintainable
4) Fault-tolerant

Q10

Types of Data Center ⟶ 1) Managed service data center
2) cloud data centers
3) Enterprise data centers
4) colocation data centers.

(VXLAN)

Q12 Tunneling Technologies ⟶ 1) Virtual Extensible Local Area Network
2) NVGRE
3) STT .