Github Questions and answers?

1] what is operating system?

↳ An os is an system software that acts as an interface between hardware and users.
It manges hardware resources (cpu, memory, storage, I/O devices) and provides services for programs to run efficiently.

Examples :- windows, linux, macos.

2] Difference between linux and windo

3] what is open source?

↳ Software whose source code is publicly availble for anyone to veiw, modify and distribute.

Ex → linux, apache, kubernetes.

4] Linux architecture?

1] Hardware :- CPU, memory, devices.

2] Kernal space :- Kernal core : processor Scheduler, memory manager virtual file system, network stack, devices drivers, system call interface, loadable kernel modules.

3] User space :- runs user processes : shells, daemons, system services application

4] System libries :- libc, privides API's used by user-space programs.

5] system utilities and init :- init systems start services and manages run levels / targets

6] file system hierchy :- /etc, /usr /var, /home, /proc /sys.

5] what is Virtualization?

:- creating a virtual version of hardware, os, storage, or network, resources. so multiple isolated enviroments can run on one physical host.

Types :- ~~Server~~ full, para, os-level containers

Use cases :- testing, snapshots, isolation, cloud

5] Hypervisor and types?

→ Hypervisor (virtual machine monitor) manages Vm's and abstract hardware for Guest's OSes.

1] Type 1 :- (Bare metal) Runs directly on host hardware.
Ex. Vmware ESXi, Microsoft Hyper-V, Xen.
pros:- performance, isolation

2] Type 2 :- (Hosted) Runs on top of a host.
Ex. Virtual box, Vmware workstation,
Easier to install, less performance than type 1

3) Special / Hybrid :- KVM is a linux Kernel module converts linux to type 1 like hypervisor often used with QEMU for full Virtualization.

7] what is shell? Types and how to current shell

→ shell → command-line interpreter that reads commands, interupts them, run programs, provide scripting.

→ sh, bash, zsh, ksh, fish, dash
→ echo $SHELL

8 What is Kernel and command to check kernel information.

→ core of the OS that manages hardware, process, memory, drivers, system calls.

↳ Uname -r → Kernel release.
↳ Uname -a full Kernel info.

cat /etc/os-release
usb- release -a
hostnamectl.

9] command to check availble memory.

→ free -h human readable memory summary.

↳

10] command to check storage/ disk

↳ df -h
lsblk
du -sh

11] to check size of file/ dir

→ du -sh /filename.

12] mode of vim editor

1] command mode :- default ; move cursor delete, copy, paste, issue command.
2] insert mode :- type (i, o, a) to enter
3] visual mode :- Select text
(v: char V: line ctrl+v: block)

4] Command-line (ex)
For command like :w, :q :s

13) adduser vs useradd
1] adduser :- higher-level, interactive script that prompts for full name, password, creates home dir, copy skeleton files,

2] useradd :- low-level binary that creates user entries
may not cretes home dir unless -m.

14] Skeleton files
/etc/skel contains files and directories copied into a new user's home directory. when the home is created. It provides default configuration for new user.

15] Field of /etc/passwd
username :- login name.
pass_placeholder :- x indicates password stored in
UID :- user id
GID :- group ID
full name or comment filed.
home directory
login shell :

16) How to check which groups a user belongs to
. group username - shows groups for username
. id username - shows UID, GID, and all groups
. for current user just group id.
Eg. id roshu

17) File type in linux (as shown by ls -l)
. - : regular file
. d : directory
. l : symbolic (soft) link
. c : character devices
. b : block devices
. p : named pipe
. s : socket

18) Hard link vs soft link
Hard link:
. points directly to same inode (same file content)
.. cannot link across different file system.
. if original file is removed, the data remains because hard link still reference inode
. Hard link cannot reference directories in normal stage.

Soft link

- A small file that points to path of target
- can cross filesystems.
- If target ~~method~~ removed, symlink becomes broken.
- In -s target linkname to create.

- How to change ownership of file/dir.
- chown user : group path → change own & grp

↳ chown rashu : developers /var/www/html.

- How to set permission using symbolic and numeric mode

↳ permission have three classes
owner, group, other.
Three permission (read, write, execute)

1] numeric (Octal)
chmod 754 file
(read write execute) owner (read execute) group (read) other

2] Symbolic
chmod u+rwx, g+rx, o+r file.

Umask?

Umask defines default permission bits to remove when new dir/files are created.
- It's mask of disallowed permission bits
- Default common Umask = 1022

default permission for root user and normal user
~~system wide~~

TCP vs UDP?

- TCP (transmission control protocol)
- connection oriented, reliable (acknowledgement, retransmission) ordered, flow and congestion control,
- Used by http, SSH, SMTP, FTP

- UDP (User datagram protocol)
- Connectionless, minimal overhead, no guarantee for delivery, order, no congestion control by default
- Used by DNS ~~server~~ gaming, RTP, VoIP, streaming

Aws

1] Cloud computing?

Cloud computing is the on-demand delivery of IT resources. (like servers, storage, databases, networking software) over the internet on a pay as you go model

- on-demand – instantly provision resources.
- Scalibility / Elasticity – Scale up / down automatically.
- Resource pooling – shared infra. for multi customers.
- measured service – pay only for what you use.
- Broad network – accessible via internet access from anywhere.

Ex. aws, Azure, GCP.

Cloud Service model.

Iaas :- infrastructure as a ~~cloud~~ service.
- provides virtualized computing resources. like Vms, storage and networks.
- user manages os and app.
- AWS EC2, GCP engine, Azure Vm

paas : platform as a service.
provides a development platform (runtime + tool's) Developer focuses only on code.

Ex. Aws Elastic Beanstalk, google app engine.

- saas :- Software as a Service.
- provides ready to use software over the internet.
- Gmail, Salesforce, google docs.

cloud deployment model.

- public cloud
- Infrastructure own by a ~~cloud~~ cloud provider and shared among multiple customers.

Aws, Azure, Gcp.

- private cloud
- Infra dedicated for one organization more control, security.

Vmware private cloud.

- Hybrid cloud
- combines public + private; allows, data / app portability.

Aws outposts, Azure stack.

Community cloud:
- Shared among organizations with common goals.

GovCloud etc.

IAM (Identity and access management)
- Iam is a security service in Aws that controls who can Access which resources and what action they can perform.

Components:
- Users - individual accounts.
- Groups - collection of users.
- Roles - temporary access permission for Aws service or users.
- policies - json document defining permissions.

policy in IAM
- A policy is a JSON document that defines what actions are allowed or denied on which resources.

Role in IAM
- Iam roles are like users but without long-term credentials.
- They provide temporary access to Aws resources.

used by:
- EC2 instances (to access S3, DB)
- lambda functions
- cross account access
- federated users

Ex:- An EC2 role with S3 read/write permission.

Iam role Vs policy

Iam role
- Identity with a set of permmision.

Use:
- Assigned to entities (EC2, users)
- Temperary credentials.
- EC2 role for S3 access.

Iam policy
- Json document defining permission.

Use:
- Attached to roles / user / group.
- Credentials are not applicable.
- S3 full Access policy.

(EC2) Elastic Compute Cloud

- EC2 provides virtual servers in cloud
- You choose OS, CPU, memory, and networking.

- Features:- launched and manages servers on demand.
- Scalable compute capacity.
- Choose instance type based on workload.
- integrates with EBS, IAM, Security Groups etc.

- EC2 Instance types:
- general purpose (t2, t3, m5)
  - Balanced compute, memory, networking.
- Compute optimized (c5)
  - High performance computing, gaming.
- memory optimized (r5, x1)
  - Database, caching.
- Storage optimized (i3, d2)
  - Big data, analytics.
- Accelerated computing (P3, g4)
  - Gpu workloads, ml, graphics.

EC2 purching option

- on-demand.
  - pay per hour/second. no commitment
- Reserved instances
  - 1 or 3 year commitment, up to 75% cheaper.
- Spot instances
  - unused EC2 capacity at 90% discount
- Saving plans
  - flexible commitment to compute usage
- dedicated Hosts/instances.
  - physical isolation for compliance.

Ami

- It is blueprint for launching EC2 instance.
- It contains OS, application software, configuration.
- used to create new instance

Ex. Landing a linux server with pre installed nginx.

Snapshot

- Backup of EBS Volume.
- It contains point in-time copy of data.
- used to store volumes or create AMI's

Ex. Backup a volume data periodically.

EBS Volume Types.

gp3 :- general purpose SSD
↳ Balanced price / performance
↳ Boot volumes, general workloads.

gp2 :- legacy SSD
↳ older general purpose.
↳ Existing workloads.

io1/io :- (provisioned IOPS SSD)
↳ Higher-performance IOPS
↳ databases

st1 :- Throughput optimized HDD)
↳ High throughput, low cost.
↳ Big data, streaming workloads.

sc1 :- cold HDD
↳ lowest cost
↳ infrequently accessed data.

- concept of load balancing.
- load balancing distributes incoming traffic across multiples servers to:-
- Improve availability.
- Increase scalibility.
- maintaine performance.

	ALB	NLB
	Application load	Network load.
	layer 7 (Application)	layer 4 (Network)
protocols:-	HTTP, HTTPS: web socket	protocols:- TCP, UDP, TLS.
Target type:-	Instance, ip. Instance, IP lambda.	Instance, ip.
Features:-	path / host-based routing, waf integration.	High performance, static ip.
use case:-	web apps. micro-services.	Real-time, high-throughput app.

- Auto Scaling :-
  - Auto Scaling automatically adjusts EC2 instance based on load.
  - Components:
    - launched templates:-
    - Auto Scaling group.
    - Scaling policies.

Benefits :- cost - efficient
High availability.
Fault tolerance.

S3 services and advantages :-
:- Simple Storage Service.
↳ object storage for any type of data.

Advantage :- Virtually unlimited Storage.
. High durability.
. Easy access via api's
: Versioning and life cycle management.
:° Integrated with many aws services.
' Cost - effective.

S3 vs ebs ?

S3	EBS
Type :- object Storage. you can store virtually any kind of data in any format	persistant block level storage for EC2 instances
• accessible to anyone or any service with the right permission	• Deliver performance for workloads that require the lowest latency access to data from a single EC2 instance.

max Storage :-
S3: Virtually unlimited
EBS: 16TiB for one instance

latency :-
S3: For mixed request types, and integration with cloud front
EBS: lowest, consistent, SSD-backend storage includes the highest performance provisioned OPS SSD.

Durability :-
S3: Stored redundantly across multiple AZs, has 99.99 % durability.
EBS: Stored redundantly in a single Az.

Backup and Restoration :-
S3: use versioning on cross region replication.
EBS: All EBS volume types offer durable Snapshot capabilities.

Service end point :-
S3: can be accessed within and outside vpc.
EBS: Accessed within one's vpc.

Notes :- • S3 is cheaper than EBS in pure Storage class.
• But EBS has higher performance than S3.

S3 Storage classes?

:- S3 offers various storage classes, each optimized for specific data access patterns and cost requirement. these classes allow you to choose the most suitable storage solution based on factors like access frequency, retrival time, and cost.

S3 Storage classes:-

S3 standard:

- Designed for frequently accessed data.
- offers high durability, availibity and performance.
- Suitable for cloud application, dynamic websites, content distribution, mobile and gaming application, and big data analytics.

S3-intelligent-tiering:

- optimized storage costs by automatically moving data between access tiers based on access patterns.
- ideals for data with unknown or changing access patterns.

S3-Standard-IA

- for long-lived, less frequently accessed data that requires rapid access when needed.
- lower storage cost than S3 standard, but incurs retrivals fees.

S3 one zone-IA

- similar to S3 standard-IA but stores data in a single AZ.
- offers lower costs than S3 standard-IA but is not resillient to the loss of an AZ.

- S3 Glacier instant Retrivels.
- For archive data that needs immediate access, typically accessed once a quater.
- offers millisecond retrivels times.

S3 Glacier flexible Retrivels.

- designed for long-term archive data where retrivels times of minutes to hours are acceptable.
- Very low storage cost, but incurs retrivels fees and has minimum storage duration

Lifecycle policy in S3?

- An S3 Lifecycle policy is a set of rules that define action to be taken on objects in an S3 bucket over time.
- These policy allow you to automate the trasition of objects between different Storage Class. or even delete objects after a specified retention period.
- Lifecycle policy are highly customizable allowing business to tailor their data management strategies to specific needs.

Benefits:- • cost optimazation.
- Efficient data management
- compliance and security.
- Improved performance.

public subnet

Internet:-
Direct access to the internet via an internet gateway

Purpose:-
Hosting resources that need to be publicly accessible like web Server.

private subnet

no direct internet access.

Hosting resources that should be kept private, such as database or application Server.

Routing:-
- Its Route table has a route for traffic to the Internet gateway.
- If route table has not a route to an internet gateway.

Outbound:-
- Can access the internet directly.
- Can access the internet indirectly by using a Nat-device.

Security:-
- less secure due to direct internet exposure
- more Secure because it is shielded from direct internet access.

NAT:- network address translation.
- is a networking technique that allows muttiple devices within a private network to access external network using a single public ip address.
- By translating private ip address into public ip address and vice versa.
- Nat conserve the limited pool of ipv4 addresses and add layer of Security by masking internal address from the outside world.