Date

Day

→ Continuous Integration (CI)

↳ Developers continuously integrate (merge) their code changes into a shared branch (like main) & every time they do, the system automatically builds, test, & verifies the code

↳ GitHub Action / Jenkins / Gitlab CI pipelines automatically runs

i- Unit Tests

ii- Code linting

iii- Build Checks

↳ If all pass → code is integrated successfully

→ Continuous Delivery (CD - Delivery)

Once code passes all tests (CI), it is automatically packaged & deployed to a staging or testing env ready for release to production — but the final step (production deployment) is manual

→ Continuous Deployment (CD - Deployment)

One step further — every change that passes thru (CI/CD) pipeline is automatically deployed to production — fully automated (no approval)

Date _____ Day _____

"Removes the handoffs – streamline the process, challenge everything that doesn't add value"

→ CAMS (Culture Automation Measurement Sharing)

Culture — Collabration, trust and communication between Dev, Ops, QA & other teams
↳ Break down silos and promote shared responsibility for SW delivery
"People over processes"

Automation — Automate repetitive & error-prone tasks to increase speed & reliability
↳ CI/CD pipelines, Automated Testing, monitoring & deployments

Lean — Focus on efficiency, eliminate waste and continuously improve
↳ Smaller frequent releases, instead of big, risky ones
↳ Short feedback loops b/w dev & users

Measurement — ~~Encourage open communications, shared learnings & transparency~~
↳ ~~Documenting best practices~~
Track key Metrics to understand performance & find areas of improvement

Date _____ Day _____

Sharing — Encourage open communication, shared learnings & transparency
↳ Documenting best practices
↳ Sharing incident reports

→ Should we have a DevOps team or hire DevOps Engineer?
↳ DevOps is not a job title — It's a culture and set of practices.
↳ The goal of DevOps is to break the wall b/w Development and Operations, not to create a new wall called DevOps team.
↳ If you are following CALMS, then you are already doing DevOps
↳ If you create another team that become yet another silo

→ DevOps Principles : Three Ways
① System Thinking
↳ Optimize the entire system, not just one team or department
↳ The goal is to make workflow efficiently from code creation to deployment
↳ Identify & remove bottlenecks.

Date _____ Day _____

② Amplifying Feedback Loop
- ↳ Create short & continuous feedback loops between developers, testers, operations & customers.
- ↳ Detect problem early, learn quickly
- ↳ Continous monitoring & Alerting
- ↳ Build automated tests into the pipeline so developess can get feedback early

③ A Culture of Continual Experimentation & Learning
- ↳ Encourage risk taking & failing forward
- ↳ Allocating time for improvement work
- ↳ Rewarding teams for taking risk
- ↳ Encourage to learn from failures
- ↳ Invest in training

▷ Seven Principles & Seven Wastes of Lean
1. Eliminating waste
   - ↳ Not code more features than needed
   - ↳ Minimize handoffs
   - ↳ Take right decisions at right time
2. Building quality.
3. Creating knowledge
4. Differing ~~comit~~ commitment

Date _____ Day _____

(5) Delive fast
(6) Respect People
(7) Optimize the whole
↳ System thinking approach

▷ A3 Problem Solving Framework → use to create culture of continuous improvement & continuous learning

(1) Set the background
↳ Include stmt of how problem directly impact business outcomes
(2) Current Condition & Problem Statement
(3) Develop Goal
(4) Performance Analysis
(5) Brainstorm
(6) Countermeasure
(7) Implementation plan
(8) Update → update "Std work" based on above steps

Date _____ Day _____

"INTRODUCTION TO AWS"

▷ On_Premise
- ↳ Everything managed by your own company — servers, storage, network, software
- ↳ A bank running its own datacenter

▷ IaaS
- ↳ Infrastructure as a Service
- ↳ Cloud provides basic infra — servers, storage and networking — you manage OS & apps
- ↳ Amazon EC2, Google Compute Engine
- ↳ You rent VMs & install OS or any software that is needed

▷ PaaS
- ↳ Platform as a Service
- ↳ Cloud provide ready made platform to build, run, deploy
- ↳ AWS elastic beanstalk

▷ SaaS
- ↳ Software as a Service
- ↳ Fully functional software
- ↳ Gmail, Google Docs, Dropbox

Date _____ Day _____

- Regions :

→ A region is a geographical area in the world where AWS has multiple data centers
  ↳ Choose region close to the intended users for low latency & to comply with local laws.

- Availability Zones (AZs)

→ Each region has multiple availability zones (usually 3 or more)
→ Each AZ is basically a seperate data center :) (cluster of data center) — with independent power, networking & cooling
→ Connected to each other with highspeed & low-latency links

High Availability → within a region accross diff ~~AZ~~ AZs
Disaste Recovery → Accross Region

- Local Zones

→ Brings AWS compute, storage and database services closes to end users in specific cities (outside region)
→ they extend the region to a specific metro area for ultra-low-latency.
  eg: gaming, streaming

Page No.

Day

- Wavelength Zones
  - → These are AWS infra deployed inside telecom networks (5G Networks).
  - → They bring compute & storage very close to mobile devices
  - → Mobile Gaming, AR/VR, autonomous vehicle etc

- AWS Outposts
  - → Outposts brings AWS infra physically into your own on-premises data center.
  - → A hospital keeping sensitive patient data locally but using Outposts for compute

▷ Selecting AWS Region

(1) Proximity to Users
  - ↳ Select region where most of users are located

(2) Compliance
  - ↳ Some countries have laws that require data to stay within nation boundaries
  - ↳ Choose region which meet regulations

(3) Service Availability
  - ↳ Not all AWS services available in every region

(4) Cost
  - ↳ Prices varies by region due to energy, land and tax differences

Date

Day

" AMAZON - VPC "

→ Amazon Virtual Private Cloud (VPC) allows user to use AWS resources in a virtual network.

→ The users can customize virtual networking environments like
  ↳ Selecting own IP range
  ↳ Creating subnets
  ↳ Configuring route tables & network gateways.

▷ Core Components
- VPC CIDR Block
- Subnet
- Gateways
- Route Table
- Network Access Control Lists (NACLs)
- Security Groups

→ VPC is a regional service

Date _____ Day _____

▷ Features

→ Specify an pvt IP ranges of your choice
→ Expand VPC by adding secondary IP ranges
10.0.0.0/16 → Primary
192.168.0.0 /24 → Secondary
→ Divide VPC private IP Address range int one or more pub or pvt subnets
→ Control inband & outband access using NACLs
→ Store Date in S3 & set permissions such that data can only be accessed from within VPC
→ Attach a public IP to any instance in VPC so it is accessible directly from Internet
→ Connect multiple VPCs thru VPC peering or transit gateway
→ Privately connect other AWS services without using Internet, thru NAT or VPC endpoints
→ Bridge VPC & onsite IT infra with an encrypted VPN connection
→ VPC Flow logs for monitoring

Date _____ Day _____

▷ Subnets

→ Range of IP Addr in VPC
→ Using public subnet for resources that must be conneted to Internet gateway
→ And pvt subnet that should not be accessible
→ Each subnet must reside with only one AZs
→ Each AZs can have multiple diff subnets

→ An Internet Gateway (igw) enables communication over internet
  ↳ A subnet attached igw is called public subnet
  ↳ An instance must have a public IPv4 or an Elastic IP Address to communicate with internet
  ↳ A VPC can only be connected with one & only one igw.
→ A subnet that has not route to igw is called a private subnet
→ A Virtual Private Network (VPN) connection enables communication with your corporate network.

Page No. [ ]

Day

- et sizing
  - ↳ The allowed block size is b/w a /16 netmask (65,536 IP Addresses) and /28 netmask (16 IP Addresses).
  - ↳ You can also associate a Secondary VPC

→ Total 5 IP's are reserved for each subnet
↳ The 1st four & last.
↳ In a subnet with CIDR block 10.0.0.0/24 the following IPs will be reserved
i- 10.0.0.0 : Network Address
ii - 10.0.0.1 : VPC Router (Gateway)
iii - 10.0.0.2 : Amazon DNS server to allow for name resolutions thru igw
iv - 10.0.0.3 : Reserved by AWS for future use
v - 10.0.0.255 : Network Broadcast Addr

▷ VPC Endpoints
↳ Iske thru hum diff AWS services ko without using igw, NAT communicate kra sakte hai.
↳ Instance in a VPC do not req public IP to communicate with resources in the service
↳ Traffic remains in Amazon network

Date _____ Day _____

↳ Benfits:
- ↳ No internet exposure (safe)
- ↳ no need for NAT (cost saving)
- ↳ stays on AWS backbone network (low latency)

Example:
- ↳ Let say you have:
  - ↳ EC2 instances in a pvt network
  - ↳ Your app uploads data to S3

Without VPC

NAT Gateway → internet → AWS S3

With VPC

EC2 → Private Route → AWS S3

(Traffic Stays inside AWS)

▷ NAT Gateway

↳ A managed AWS service that allows pvt subnets instances (without public IPs) to access the internet but blocks incoming connections from the internet

↳ Outbound internet access only

↳ Used by instances to download updates or call external API's

Pvt EC2 → NAT Gateway → IGW

Date _____ Day _____

Security Groups	NACLs
① Operates at instance level	① Operates at subnet level
② All inbound traffic is denied, all outbound allowed (Default)	② All outbound & inbound allowed (Default)
③ Only Allow Rule	③ Both Allow & Deny rules
④ All rules are evaluated together; the most permissive one applies	④ Rules are evaluated in order (lowest no → highest) until a match is found
⑤ Applies to individual instances	⑤ Applies to all resources within a subnet
⑥ Act as firewall at instance level	⑥ Act as a firewall at subnet level
⑦ Stateful: Return traffic automatically allowed	⑦ Stateless: Return traffic must be explicitly allowed by rule

▷ Flow Logs

↳ Capture info about IP traffic going to & from network interfaces in VPC

Date _____ Day _____

▷ VPC Peering

→ Allows two VPCs to communicate with each other using pvt IP addresses, as if they were part of same network.

→ It is like building a secure tunnel b/w two buildings (VPCs)

→ Bidirectional connection

→ Can be within region or across

→ Must update route tables in both VPCs to send traffic thru peering

→ No transitive property

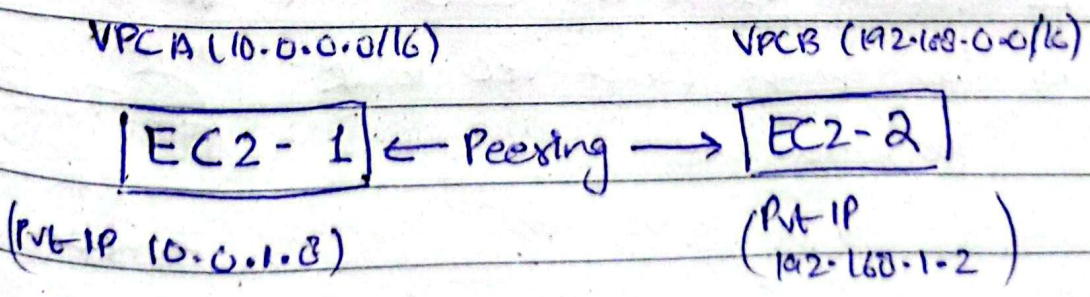
VPC A → VPC B

VPC B → VPC C

VPC A → VPC C ✗

→ Cannot have overlapping CIDR blocks b/w VPCs

→ Here the one initiating the connection is the requestor & other is acceptor.



Date _____ Day _____

→ Edge to edge routing through a gateway or pvt network not allowed. As it would become transitive

(A) → (peering) → B → (Internet Gateway)

↳ ~~Since all VPCs are isolated so it~~ AWS intentionally forbids this to preserve network isolation & security blw VPCs

▷ Transit Gateway (TGW)

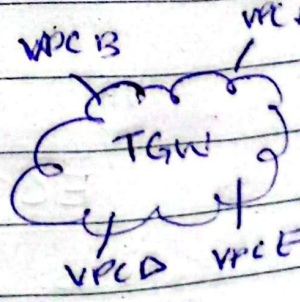
→ A central hub that connects multiple VPCs, on-prem networks and even other AWS regions — all thru a single, scalable gateway

→ Connect everything once to the TGW — it routes traffic intelligently

→ In Peering you would need $\frac{n \times (n-1)}{2}$ connections where as in TGW only "n" connections needed

→ Transitive routing supported

→ Can control which VPC talk to which one



Date _____ Day _____

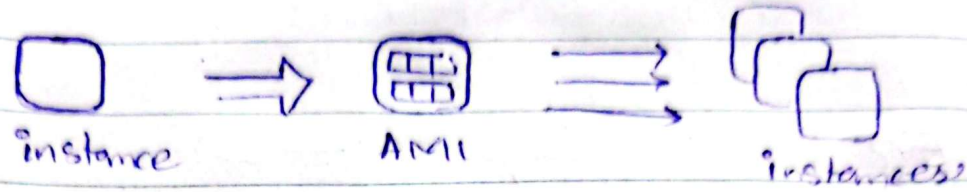
"AMAZON - EC2"

→ Elastic Cloud Compute — allows to run applications & programs in the cloud env"

→ Enables to vary the capacity within minutes
→ EC2 virtual computing env, known as instances.
→ Preconfigured templates — Amazon Machine Image (AMI)
→ Persistant storage volumes for the data using Amazon Elastic Block Store (Amazon EBS Volume)
→ Also have security groups
→ Temporary data storage deleted when instance stop or terminate known as instance store volumes

▷ Amazon Machine Image
"Provides the info required to launch an instance, which is a virtual server in the cloud."
→ You must specify src AMI when launch an instance
→ A block device mapping specifies the volumes to attach to the instance when it's launched

Date Day



- Amazon Elastic Block Store (EBS)
  - → Provides persistent, highly available, consistent low-latency block storage volumes for use with EC2
  - → Block Storage service for EC2
  - → Works as virtual hard drive
  - → Each EBS volume exists in one AZ (not across region). Replicated automatically with the same AZ for fault tolerance
  - → Provides encryption
  - → Protect data by creating point-in time snapshots of EBS volumes.
  - → Access management

IOPS : No. of read & write operations per second

Throughput : No. of bits read or write per second

▷ GiB v GB

GB	GigaByte	Decimal (Base 10)	$1\,GB = 10^9$
GiB	Gibibyte	Binary (Base 2)	$1\,GiB = 2^{30}$

Date _____ Day _____

100 GiB = 100 x 1.073741824 GB

= 107.37 GB

▷ Stop Vs Terminate

↓	↓
Instance is shutdown but memory remains intact	instance permanently deleted along with EBS.
Can be restart	Cannot be restarted