

- Static content cache
- Dynamic content cache
- Compute distribution
- Persistency
- Decoupling methods
- For each component, explain in few words (other than adding complexity), what are the trade offs of introducing these components if they weren't added before

Answer in file `Part I/Part I.6.md`

## Part II. Classic AWS Architecture design (30 marks total)

Research, design, draw figures and find ways to improve the existing architecture. You will be expected to produce detailed infrastructure and network flow design.

References:

- [AWS NFWF for centralized Egress](#)
- [AWS NFWF for centralized Ingress](#)
- [All inspection models for AWS Network Firewall](#)

Expected submission formats are:

- Graphics files `.drawio` or exported `.png` in high resolution.
- Any notes and long form answers to be placed in file `Part II/Answer.md`
- It is encouraged to reference to `.png` images inside file `Part II/Answer.md`

Given information:

- The entire CIDR range of the VPC is `10.0.0.0/16`
- There are 3 AZs to be used for the VPC
- Each Subnets tiers will span across all same 3 AZs
- There are 5 VPC tiers from top to bottom
  - Public subnets with AWS Network Firewall `Firewall Tier`.
  - Public subnets but protected by AWS Network Firewall where AWS ALB and NATGW sit `Protected Tier`.
  - Private subnets `Multi-Purpose Tier` where different EC2 workloads called `services/microservices` are managed by AutoScalingGroup, load balanced by ALB from the tier above.
  - Private subnets `Secure Tier` where RDS, EFS and other AWS Managed databases reside

- Private subnets **Management Tier** where few EC2 jump host are available only for the AWS Manager - Session Manager to use and only access RDS in the **Secure Tier**. No other hoops are allowed.
- All traffic coming into the VPC must be inspected by the AWS Network Firewall service
- All traffic going out to the public internet must be inspected by AWS Network Firewall service as well

## Part II.1. - Base design questions (20/30 marks)

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To provide illustration in **.drawio** or exported **.png** :

- (5/30 marks) Suggest a CIDR division table for each subnets in each Network tiers
- (5/30 marks) To illustrate the VPC, Subnets design according to your CIDR division above
- (5/30 marks) To correctly place these components:
  - EC2 in AutoScalingGroups
  - RDS database and EFS network file system with 1-AZ failover setup (feel free to choose main and failover AZ)
  - ALB and NATGW
  - AWS Network Firewall endpoints
  - IGW (AWS Internet Gateway)
- (5/30 marks) To correctly design:
  - The Route Tables as well as
  - Inbound and Outbound rules for the different Security Groups

## Part II.2. - Expansive network design questions (10/30 marks)

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To answer in file **Part II/Answer.md** and draw additional figures:

- (5/30 marks) How would you add access for the EC2 instances to S3 and DynamoDB?
  - Least convenient method explained only get 1/5 marks
  - Most convenient method explained will get 2/5 marks
  - Explain and correctly illustrate the most convenient method and all added components will get full 5/5 marks
- (5/30 marks) Given that there are 2 AutoScalingGroups for 2 different applications, illustrate the flow of traffic in 3 different Network diagram figures (use the Base design figure as a starting point):

- In Green arrows: from 1 API Service Group to another (1 separate figure expected)
- In Orange arrows: from 1 API Service to reach out to Google Maps API in the public internet to get more data (another separate figure expected)
- In Blue arrows: requests from public internet to reach one of the API Services (and another separate figure expected)

## Part II.3. - Bonus design questions (bonus 5 marks)

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To answer in file `Part II/Part II.1/Bonus.md` and draw additional figures:

- (3 marks) If you were to adopt a container orchestration engine and an associated compute engine on AWS to replace EC2 and AutoScalingGroup:
  - What would you use? Why do you think you would like to work with your selected option based on your personal preference?
  - Which benefits would you gain over EC2 combined with AutoScalingGroup?
  - Can you illustrate how your new infrastructure design would look like?
- (1 mark) What problem does Service Discovery solve? What is the Service Discovery AWS offering for your Container Orchestration and Compute option?
- (1 mark) What problem does Service Mesh solve? What is the AWS Service Mesh offering for your Container Orchestration and Compute option?

Hint: don't forget the the Container Registry component

## Part III. AWS Native Architecture design (10 marks total)

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Research, design, draw figures.

Design exercise requirements:

- The client wishes to build a news aggregator web app to earn money with Google Ads
  - The backend constantly look for latest news from many different news websites. Some sites require refreshing data every 10 seconds, some sites less frequently
  - Save the aggregated news headline and links into a no management database with infinite scale
  - The backend should use a no management APIGW to allow for the static website to make API calls to
- The website should be ideally