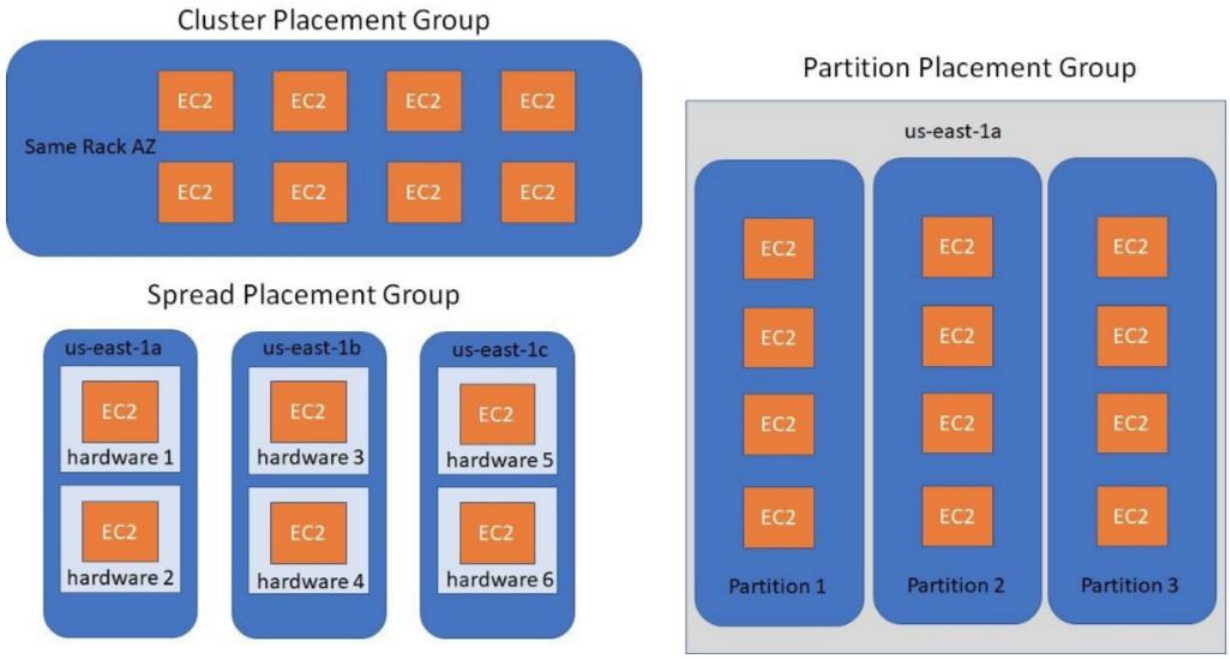
What are different types of placement group? Why do we need it?

What are Placement Groups?

Placement Groups are a way to control **how EC2 instances are placed** on the AWS hardware (servers and racks).
They help you **optimize** for **performance, low latency, and high throughput**, depending on your application's needs.

AWS gives you **three types** of Placement Groups:



🔷 1. Cluster Placement Group

- **Meaning**: All EC2 instances are placed very close together **inside a single Availability Zone**.
- **Best for**: High network performance (e.g., **low latency**, **high throughput**).
- **Use case examples**:
    - High-Performance Computing (HPC) apps
    - Big Data jobs
    - Applications needing fast inter-node communication (like a Cassandra database cluster).

⚡ *Instances get 10 Gbps+ network speeds when clustered!*

🔷 2. Spread Placement Group

- **Meaning**: EC2 instances are **spread across different hardware** (different racks).
- **Best for**: High **resilience** — if one hardware fails, others are safe.
- **Use case examples**:
    - Critical workloads
    - Small number of instances (up to 7 per AZ) that must not fail together.

🛡️ *Helps you survive hardware failure better!*

🔷 3. Partition Placement Group

- **Meaning**: EC2 instances are divided into **logical partitions**; each partition uses **separate hardware**.
- **Best for**: Very **large scale** distributed apps that need fault tolerance.
- **Use case examples**:
    - Big Data systems like Hadoop, HDFS
    - Large distributed databases like HBase, Cassandra.

🗄️ *Partitions help you manage thousands of instances across racks!*

🛠️ When do you use Placement Groups?

- When you **need high-speed networking** between instances (use Cluster).
- When you **cannot afford losing multiple instances together** (use Spread).
- When **running very large distributed systems** needing **fault isolation** (use Partition).

❗ Is Placement Group Available for All Instance Types?

No. Placement groups have **instance type limitations**:

- **Cluster Placement Groups:**
    - Supported by most **compute-optimized**, **memory-optimized**, and **storage-optimized** instance families like `c5`, `m5`, `r5`, etc.
    - **Not supported** by older generation types or `t2`, `t3`, `t4g`, etc.
- **Spread and Partition Placement Groups:**
    - More broadly supported, including general-purpose types.

✨ Quick Summary Table

Type	Focus	Use For
Cluster	Speed & Low Latency	High-performance apps, HPC
Spread	Fault Tolerance	Critical apps, small count
Partition	Fault Isolation at Scale	Big Data, distributed apps

Q1. Which Placement Group type is best suited for low-latency, high-throughput network performance between EC2 instances?
a) Spread Placement Group
b) Cluster Placement Group

c) Partition Placement Group
d) Auto Scaling Group

✅ **Answer:** b) Cluster Placement Group

Q2. In which Placement Group are instances distributed across different racks to reduce the risk of simultaneous hardware failure?
a) Cluster
b) Partition
c) Spread
d) VPC Peering

✅ **Answer:** c) Spread