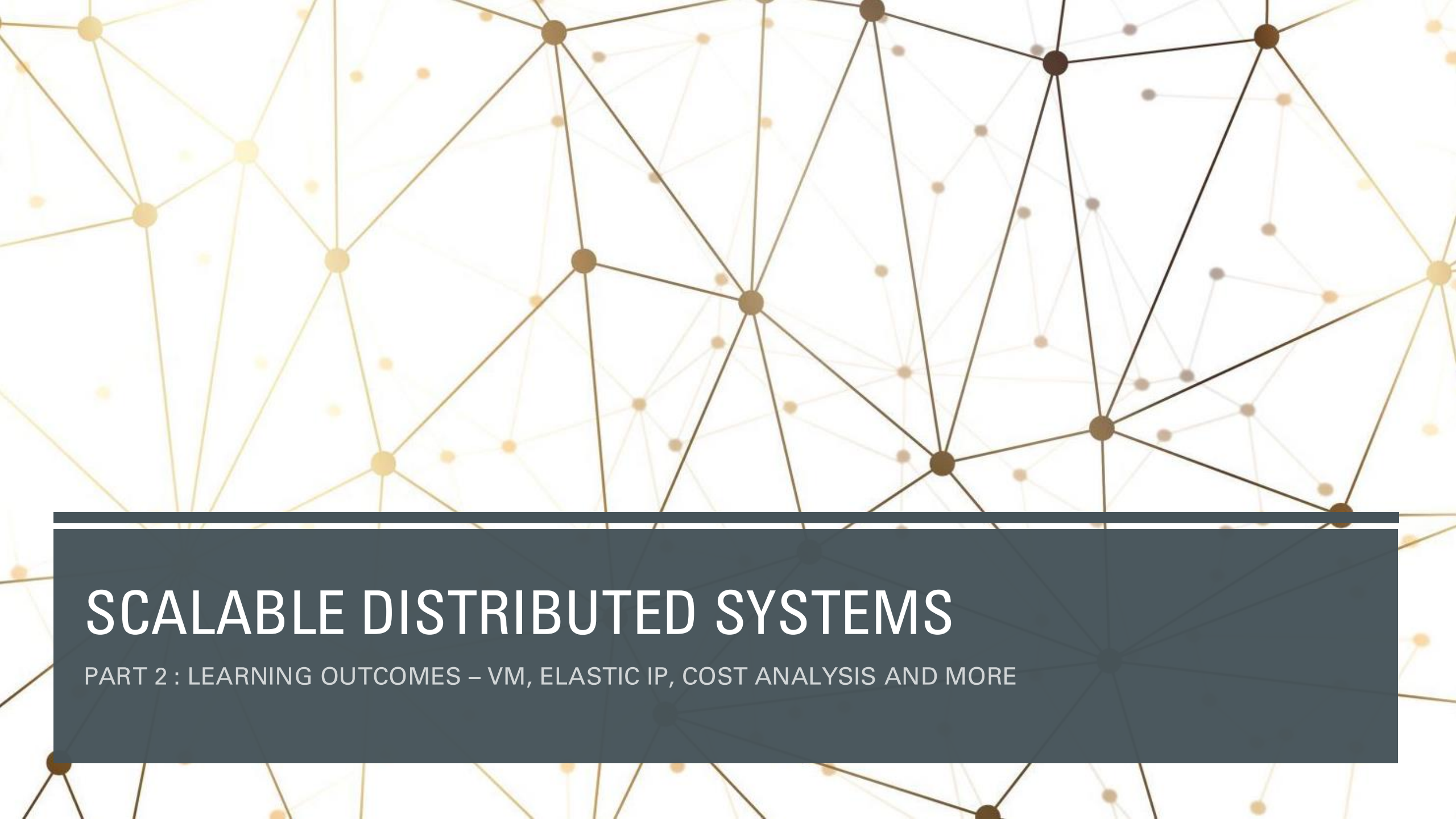


SCALABLE DISTRIBUTED SYSTEMS

PART 2 : LEARNING OUTCOMES – VM, ELASTIC IP, COST ANALYSIS AND MORE

VIRTUAL MACHINE

- A Software based, virtual replica of a physical computer.
- It runs on top of a hypervisor.
- Has its own operating system.

How is it different from running locally ?

- **Isolation:** VM is completely separate from your local machine
- **Remote Access**: Access over network
- **Available 24/7**: Can run 24/7 even when your laptop is off
- **Scalability**: Can easily resize or replicate

WHAT IF IP ADDRESS OF EC2 MACHINE CHANGE?

We would need to **update the security group inbound rule**:

- Go to EC2 Console → Security Groups
- Select your security group
- Edit inbound rules for SSH (port 22)
- Change the source from the old IP to "My IP" (auto-detects current IP)
- Save rules

Alternatively, we could also allow traffic from anywhere in the network but this is not suggested for production level systems.

ELASTIC IP

Problem: EC2 instances get a new public IP every time they stop/start

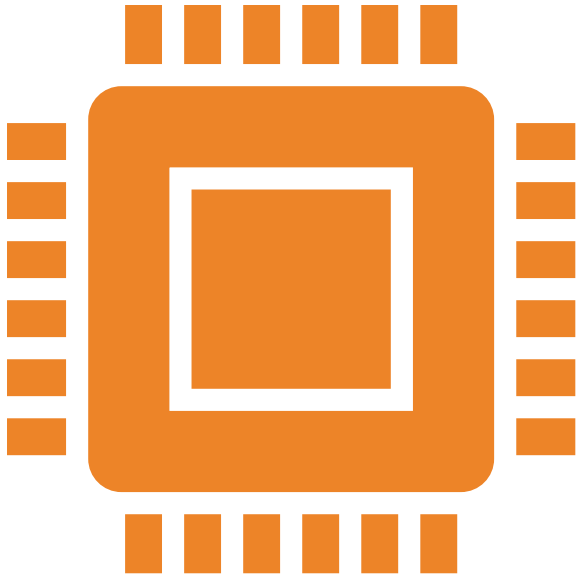
Solution: Elastic IP is a **static public IPv4 address** you can:

Allocate to your AWS account	Associate with your EC2 instance	Keep even when instance stops/starts	Remap to different instances instantly

Cost:

$0.005/hour whether idle (not attached) or in-use (attached to a resource like an EC2 instance or load balancer)

T2.MICRO INSTANCE



t2.micro specs:

- 1 vCPU (virtual CPU)
- 1 GB RAM
- Low to moderate network performance
- Free tier eligible (750 hours/month for 12 months)

Why care about specs?

- **Performance**: More CPU/RAM = faster processing
- **Cost**: Bigger instances cost more (t2.micro ~$0.0116/hour vs r5.24xlarge ~$6.912/hour)
- **Workload matching**:
  - t2.micro: Development, testing, light web servers
  - c5: Compute-intensive (video encoding, ML)
  - r5: Memory-intensive (databases, caching)
  - g4: GPU workloads (ML training, graphics)

GCP CLOUD SHELL VS AWS

GCP Cloud Shell

- Zero setup - click & code
- Go pre-installed
- No security config needed
- Free (50 hrs/week)
- Temporary VM (dev only)

AWS:

- Setup: instance, keys, security
- Cross-compile + SCP upload
- Manual firewall rules
- IP changes on restart
- Costs Money if EC2 is kept on
- Production-ready, 24/7

TESTING

From Your Laptop

- `curl http://EC2-IP:8080/albums`
- Test security groups, verify public access

Inside EC2 (SSH)

- `curl localhost:8080/albums`
- Quick sanity check, verify server running