**#System Design**

**Why we need system design?**

1. **Scalability**
2. **Efficiency** – System should be effiecient in the use of time, money, resources. i.e. optimal system.
3. **Maintainability** – System should be maintainable for the sake of clarity and modification if needed.
4. **Performance**
5. **Reliability**
6. **User-experience**
7. **Security**
8. **Cost-effectiveness**

**System Design with example:**

* **Vertical scaling:** Optimize process and increase throughput with the same resource.
* **Preprocessing & cronjob:** Preprocessing in the non-peak time.
* **Backups:** Keeping a backup and avoid single point of failure.
* **Horizontal scaling:** Buy more resources so more performance.
* **Distributed System:** We cannot keep all our eggs in one basket. For more fault tolerant.
* **Load balancing:** A single traffic cop is sitting which takes incoming requests and forwards to healthy servers so no single server is overwhelmed.
* **Decoupling:** Reducing dependency between different parts of system.
* **Logging and Metrics calculation:** Storing logs and metrics.
* **Extensibility:** It means designing system such that new features can be implemented easily.

**Microservice:**

* Small and independent softwares.
* Used to perform specific tasks.
* Can be developed and deployed and scaled independently.
* Can communicate via APIs.

Scaling:

* Vertical Scaling
* Horizondal Scaling