

N-Tier (Multi Tier) Software Architecture

Difference between Physical Separation and Logical Separation

MVC te ekta computer ei shob code chilo (Logical Separation). That was 1-tier. 1-tier e shob code same computer e. 2-tier e ekta computer e kichu code, arekta computer e kichu code rakhbo. 3-tier e ekta computer e kichu code, baki duita computer e baki code. (Physical Separation)

3-Tier Architecture

<https://www.guru99.com/n-tier-architecture-system-concepts-tips.html>

<https://www.appsierra.com/blog/tiers-in-software-architecture>

2-Tier Architecture

Client / Presentation Tier

Business logic ei tier e thake.

Client directly database access kore. (Alada kono application nai. Direct API call er maddhome data gula ane.)

Database Server

Kaj hocche shudhu JSON response provide kora.

1-Tier Architecture

Example - calculator

- Kono network activity thakte parbe na.
- Kono message passing thakbe na.
- Standalone Software hobe. Ekta device er moddhei data store shoho shob hoy.

3+ Tier Architecture

3-tier er joto upore jabo, 3 tier oi 3 ta tier gular jekono ta venge multiple tier banabo.

Presentation Tier
Business Logic Tier
Data Access Tier
Database Tier

Ekhane Application tier ke venge duita tier kora hoise.

Advantages and Disadvantages

1 Tier & 2 Tier

Advantages

Simple; bcz multiple device e message passing handle korte hocche na.

Fast for a lower number of users. Bcz client direct database er sathe communicate kortese.

Low cost for hardware, maintenance, deployment.

Disadvantages

Scalability: Client beshi hoile database er load toto beshi porbe. Scalability thakbe na.

Security: Client direct database access kortese without validation. Security nai.

Fault Tolerance: Suppose, amar server ta jekhane shei jaygar electricity nai. Taile to server access korte parbo na. Ekta database server crash korlei pura application down. 2-tier e fault tolerance kom. Database server crash korle pura application down. Backup o rakha jay na, backup rakhte gele tokhon oita ar 2-tier taktese na.

Data Integrity: Data integrity onek kom. Bcz client iccha moto database access kortese, kono proper way maintain kora jay na.

Reusability

Maintainability

→ Multi Tier

Advantages

◆ Scalable

- Ekta tier venge multiple tier banate pari. Basic Ali, jotogula physical device, totota tier.
- *Scalability kemne barabo?*
 - Database clustering kore scale up korte pari.
 - Client direct database access korte partese na, application server er through te access kore. Multiple client application server e access kore, and application server theke ekta connection database e jacche. So database e load kom portese. Application er scalability barlo!
 - Multiple application server, multiple database server er moddhe load ta distribute korte alada ekta separate server rakhbo jeta Load Balancer hishebe kaj krbe. Evabe application ta highly scalable hoilo.

◆ Fault Tolerance

- *Ekta server ke easily cluster korte pari for load balancing and fault tolerance.*
- Fault tolerance beshi. Ekta server crash korle onno server theke request ta niye ashlam.

◆ Security

- Business logic & Database e beshi security dorkar. Security baranor jonno prottekta server er jonno alada alada **firewall** install korte pari. Lagle business logic e more security er jonno extra server ee boshay dilam, jeta 1-tier/2-tier e korte partam na.

◆ Data Integrity

- Related to security.

◆ Reusability

- Reusable; bcz code ke joto module e vaag korbo, code toto reusable hobe.

◆ Maintainability

- Easily maintainable; completely different server/computer howate baki tier gula affect na korei kono tier er code modify korte pari.

Disadvantages

◆ Higher bandwidth

- Bandwidth beshi na hoile application slow hoye jabe, bcz prochur message passing.

◆ Higher cost

SQL vs NoSQL → Self study

When to use what

Why Horizontal and Vertical scaling both are possible in NoSQL?

- Chaile shob gula data ke ekta collection e rakhte pari. Chaile ei collection ke onek gula server e distribute kore rakhte pari.
- Ekta particular server ke spec up korte partesi -> Vertical Scaling
- Data ta onek gula server e distribute kore rakhte partesi -> Horizontal Scaling

Why is Horizontal scaling not possible in SQL?

- SQL e NoSQL er moto easily table gula distribute kore kore multiple server e rakhte parbo na. Shudhu ekta server e spec up korte parbo.

Examples -

- SQL -> Oracle, MySQL
- NoSQL -> MongoDB, Firebase