CLUSTER COMPUTING VS GRID COMPUTING

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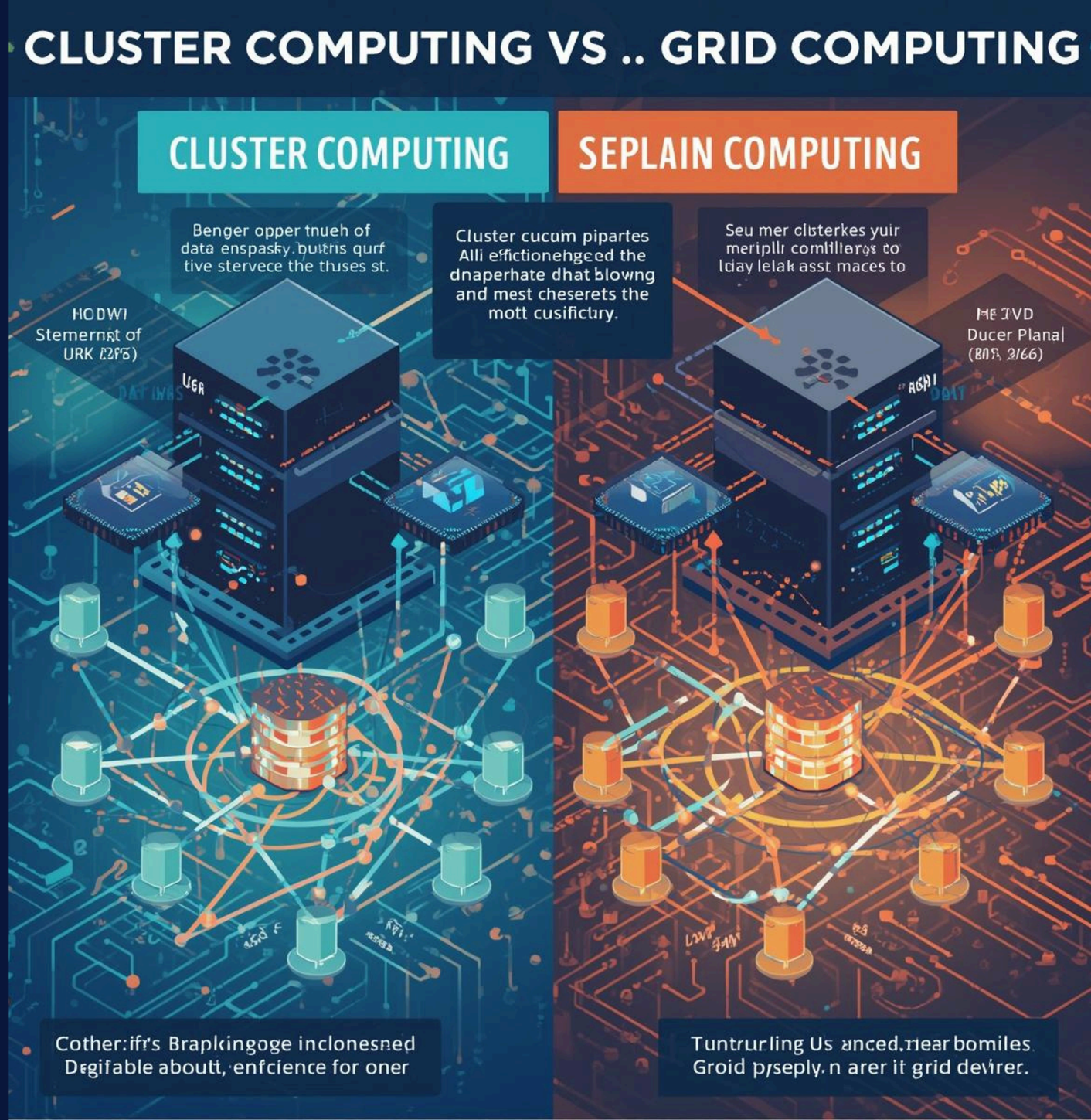
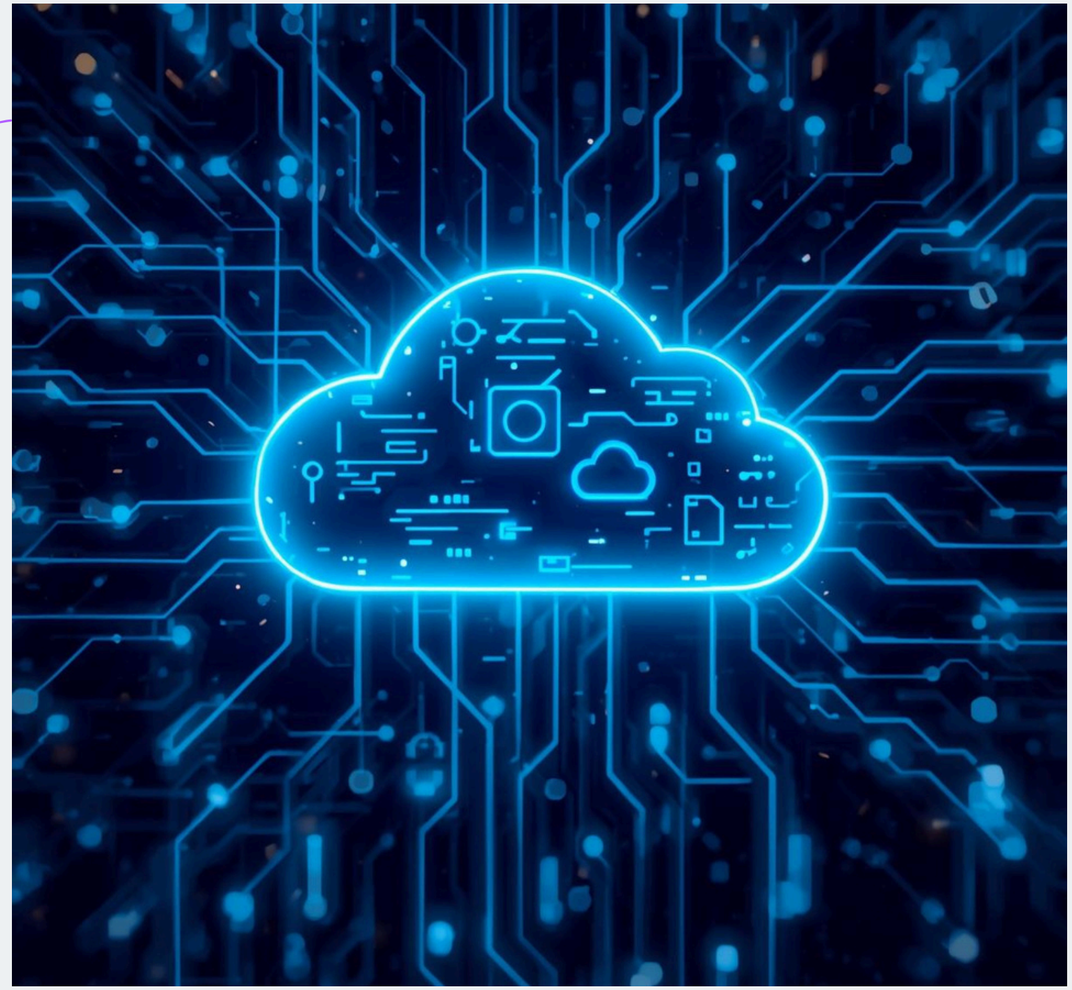


Introduction

Modern computing systems are designed to handle large amounts of data and complex operations. As applications grow in size and demand, single computer systems become insufficient. To overcome this limitation, advanced computing models like cluster computing and grid computing are used to improve processing speed and efficiency



The Demand for Processing Power

Complex tasks require immense computational strength.

Why Distributed Matters

Leveraging multiple resources for efficiency and scale.

Cluster Computing: Unified Power

Definition:

A cluster consists of multiple computers (nodes) networked together, working as a single, unified system to solve complex computational problems.

How It Works

- Nodes share resources via high-speed LAN.
- Often managed by central software.

Key Characteristics

- High-performance computing (HPC).
- Single physical location.
- Tightly coupled nodes.

Grid Computing: Distributed Resources

Definition:
Grid computing connects geographically dispersed computer resources to create a powerful virtual supercomputer for tackling large-scale problems.

Key Characteristics

- Geographically distributed.
- Loosely coupled, diverse systems.
- Focus on resource sharing.

How It Works

- Decentralized resource sharing.
- Internet-based connectivity.

Where They Shine

Cluster Computing

- Scientific simulations (weather models, molecular dynamics)
- Data centres (high-volume transactions)
- Banking systems (fraud detection, real-time analytics)

Grid Computing

- Weather forecasting (global climate models)
- Research projects (drug discovery, genomics)
- Scientific collaborations (large-scale data processing)

Who's Using It?

Google

Massive internal clusters for search, data processing, and cloud services.

Amazon (AWS)

Utilizes large clusters to power its vast cloud infrastructure and services.

IBM

Uses cluster and grid computing for scientific research, weather modeling, and high-performance data analysis.

Facebook

Relies on clusters for social graph analysis, content delivery, and AI.

NASA

Leverages grid resources for complex aerospace simulations and data processing.

Microsoft (Azure)

Uses large computing clusters to run cloud services, data storage, and AI applications.

Key Differentiators

Parameter	Cluster Computing	Grid Computing
Location	Single, localized	Geographically distributed
Performance	High (tightly integrated)	Variable (network dependent)
Scalability	Scales within a data centre	Scales globally, across organizations
Management	Easier, unified control	Complex, federated control
Coupling	Tightly coupled	Loosely coupled
Data Sharing	Shared memory/storage	Distributed data access

Choosing the Right Approach

Evaluate Your Needs

Consider performance, scalability, and security requirements.

Cluster for Speed

Ideal for high-performance, tightly coupled tasks within a single domain.

Grid for Scale

Best for massive, distributed problems leveraging disparate resources.

Both cluster and grid computing continue to evolve, driving innovation in areas like AI, big data, and scientific discovery.

THANK YOU