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DYNAMIC RESOURCE MANAGEMENT IN EDGE-CLOUD

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INTRODUCTION TO DYNAMIC RESOURCE MANAGEMENT IN EDGE-CLOUD

Dynamic Resource Management in Edge-Cloud is essential for optimising resource allocation and utilisation in diverse computing environments. This presentation will explore the fundamental concepts, challenges, and techniques of dynamic resource management, emphasising its role in enhancing Edge-Cloud Resource Orchestration.

OVERVIEW OF EDGE-CLOUD RESOURCE ORCHESTRATION

Edge-Cloud Resource Orchestration involves the efficient provisioning and management of resources across edge-cloud environments. It focuses on strategies for resource allocation, **scalability**, and **elasticity**, addressing the unique challenges posed by distributed computing at the network's edge.

INTRODUCTION TO DYNAMIC RESOURCE MANAGEMENT

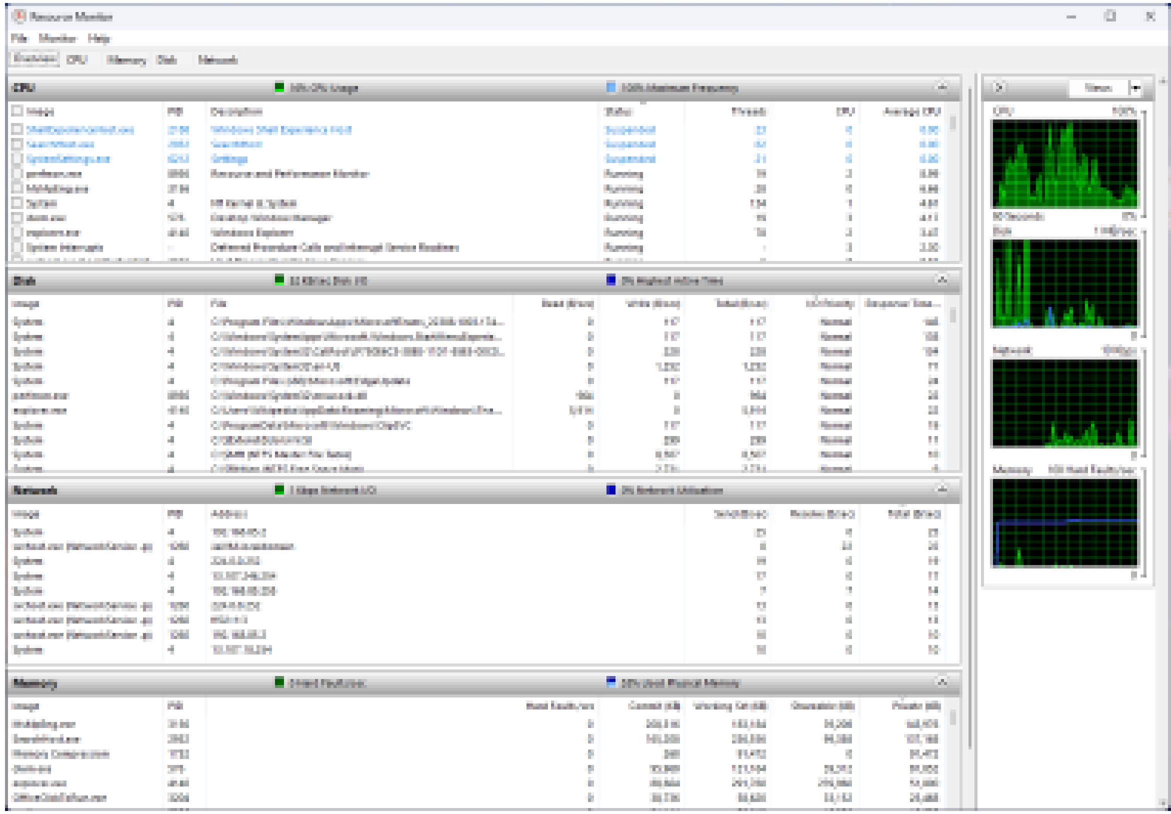
Dynamic resource management is pivotal within Edge-Cloud Resource Orchestration. It facilitates the real-time allocation and de-allocation of resources based on fluctuating workload patterns and application demands. This ensures optimal resource utilisation while maintaining necessary service quality and performance levels.

RESOURCE IDENTIFICATION AND DISCOVERY

The initial step in dynamic resource management is identifying and discovering available resources. These resources can be physical devices, such as **IoT devices** and gateways, or virtual machines (VMs) located across edge and cloud data centres. Techniques like **service discovery protocols** and **network scanning** are employed to dynamically discover available resources.

RESOURCE MONITORING AND PROFILING

Once resources are identified, continuous monitoring and profiling are essential. Monitoring involves collecting metrics like **CPU utilisation**, **memory consumption**, and **network latency**. Profiling generates resource profiles that detail the capabilities and characteristics of each resource, aiding informed decision-making in resource management.



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LOAD BALANCING AND RESOURCE ALLOCATION

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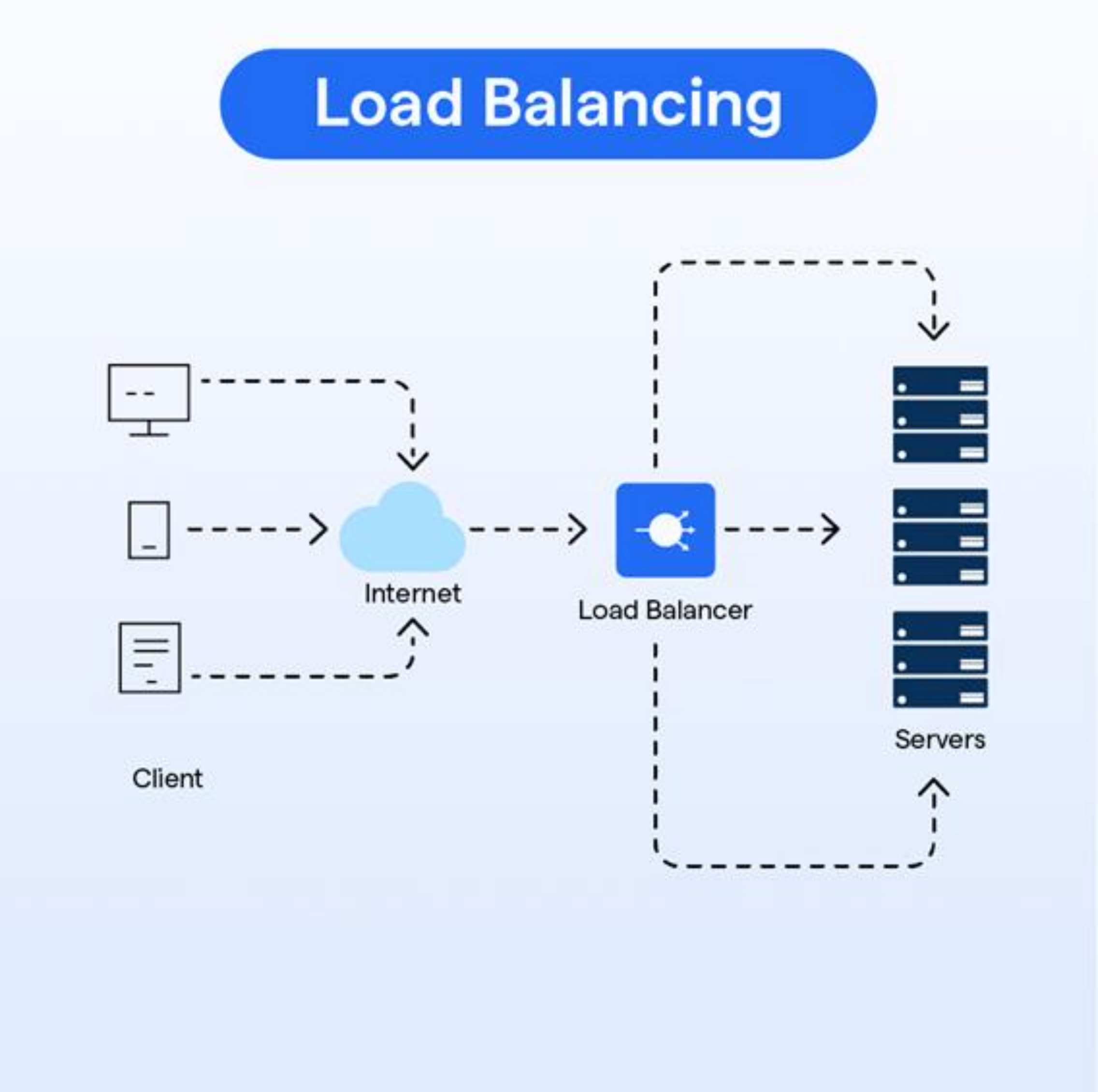
Dynamic resource management encompasses load balancing and resource allocation to optimise resource utilisation.

- Load balancing techniques, such as **round-robin** and **least connection**, distribute incoming requests evenly.
- Resource allocation strategies, including **bin packing algorithms** and **greedy heuristics**, allocate resources based on workload needs and constraints.



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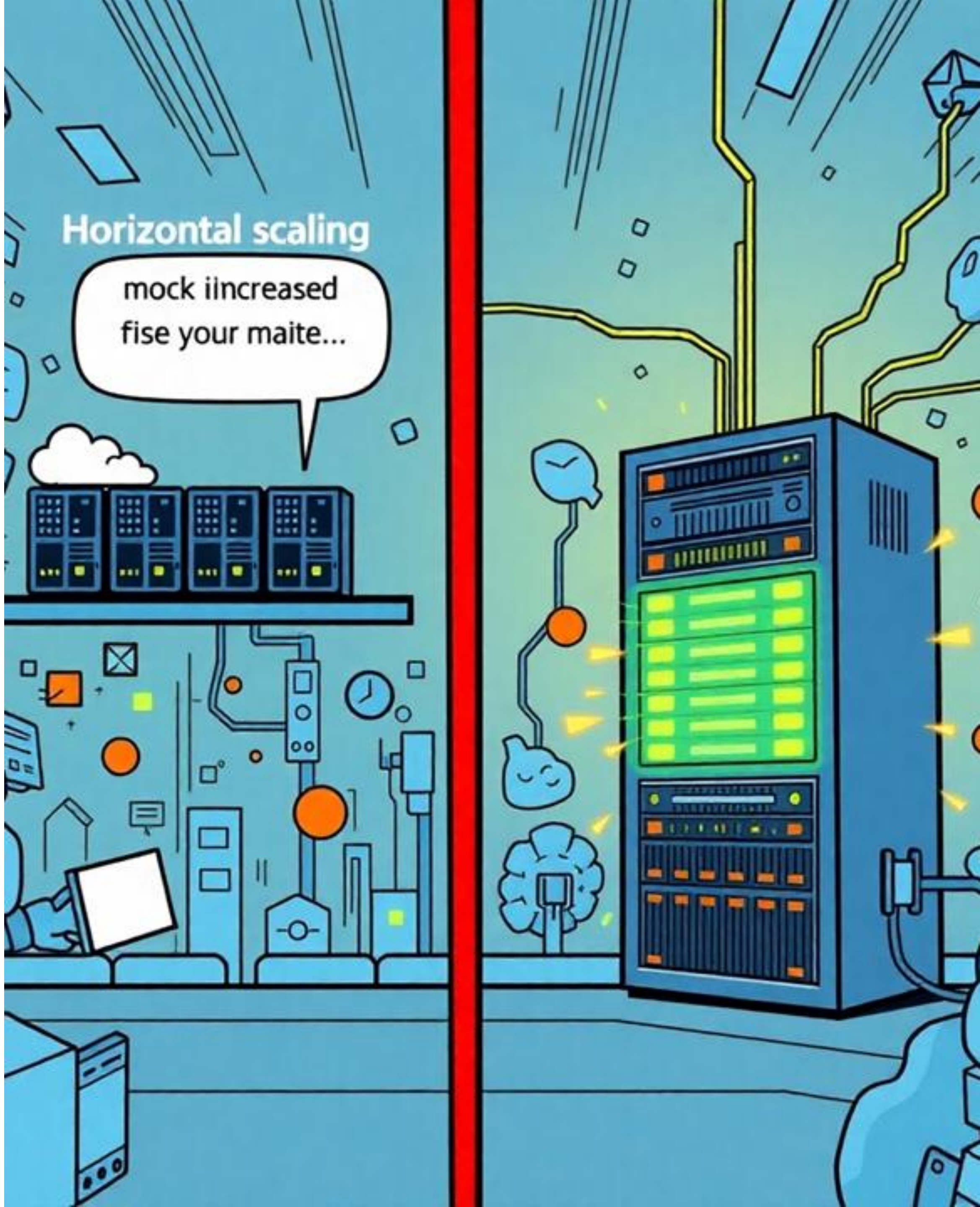
RESOURCE SCALING AND ELASTICITY

Resource scaling and elasticity are vital for managing fluctuating workloads. **Horizontal scaling** involves adding more resources to meet increased demand, while **vertical scaling** enhances existing resources' capacity. Elasticity allows for the dynamic addition or removal of resources based on workload patterns and **Service Level Agreement (SLA)** requirements.



FAULT TOLERANCE AND RESILIENCE

Dynamic resource management must address fault tolerance and resilience. Failures in the edge-cloud environment should not severely impact service availability. Techniques such as **fault detection**, **fault recovery**, and **resource replication** are critical for ensuring high availability and fault tolerance.

OPTIMISATION AND RESOURCE RECONFIGURATION

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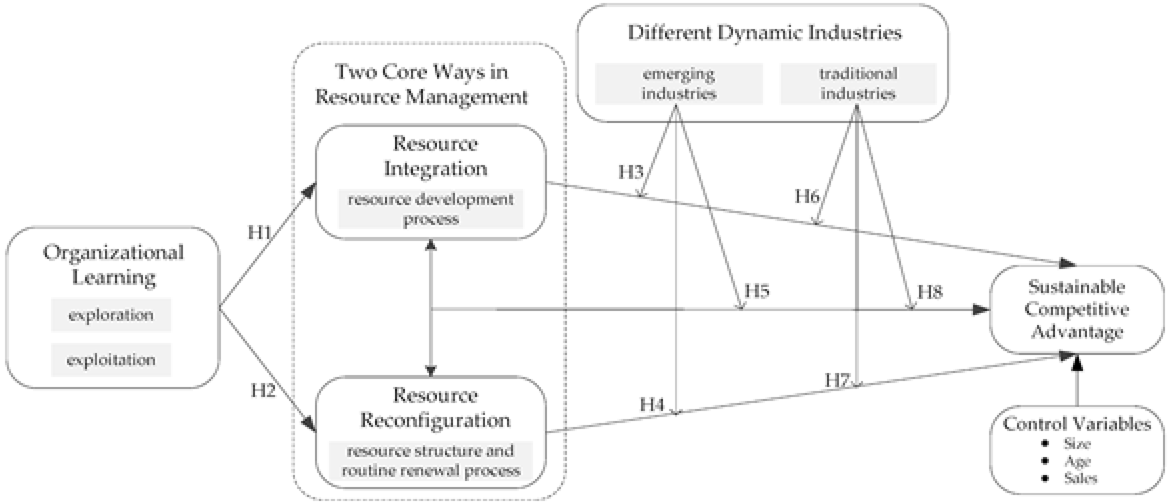
Continuous resource reconfiguration is necessary for optimising management. The system should adapt resource configurations based on workload patterns and utilisation to enhance performance, reduce costs, and improve **energy efficiency**. Optimisation algorithms, like **genetic algorithms** and **reinforcement learning**, can be applied to solve resource allocation challenges.



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CONCLUSION:

IMPORTANCE OF DYNAMIC RESOURCE MANAGEMENT IN EDGE-CLOUD

In conclusion, dynamic resource management is crucial for Edge-Cloud Resource Orchestration. It supports efficient resource allocation, load balancing, scalability, and fault tolerance, enabling intelligent management of resources. By mastering dynamic resource management techniques, organisations can leverage the benefits of edge computing and cloud resources, meeting the demands of modern distributed computing applications effectively.