



**Load Balancing Multi  
and Hybrid Cloud Solutions**  
**SKILLSOFT ASPIRE JOURNEY**

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Aspire Journeys 

# Load Balancing Multi and Hybrid Cloud Solutions

The Load Balancing Multi and Hybrid Cloud Solutions Journey explores load balancing in high availability, agnostic server/cloud, or multi-cloud platform. High availability topics run through each of the learning paths and are mentioned within each topic's context. We discuss different load balancing strategies for traditional, cloud, and multi-cloud deployments during this learning journey. Later, we will discuss popular load balancing technologies, vendors, and design patterns.

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## Tracks



### Track 1: Multi-cloud Load Balancing Principles

In this Skillsoft Aspire journey track of the Load Balancing Multi and Hybrid Cloud Solutions Journey, the focus will be on load balancing in multi-cloud and CloudOps, hybrid and multi-cloud architectur...

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### Track 2: Solutions for Multi-cloud Load Balancing

In this Skillsoft Aspire journey track of the Load Balancing Multi and Hybrid Cloud Solutions Journey, the focus will be on disaster and backup strategies with multi-cloud load balancing, working with lo...

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## PREREQUISITES

In order to fully profit from the potential of this Aspire Journey, we recommend the following prerequisite skills:

- Familiarity with Load Balancing
- Familiarity with hybrid and multi-cloud architectures
- Familiarity with Docker and Kubernetes

# Track 1: Multi-cloud Load Balancing Principles



In this Skillssoft Aspire journey track of the Load Balancing Multi and Hybrid Cloud Solutions Journey, the focus will be on load balancing in multi-cloud and CloudOps, hybrid and multi-cloud architecture load balancing design, hybrid and multi-cloud management considerations, and security and privacy considerations in load balancing.

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## Multi-cloud Load Balancing: Principles of Load Balancing

### Objectives:

- describe what load balancing is, where it is used, and what forms load balancers come in
- recognize the advancements in load balancing technology and how to enable them in the cloud
- identify the different protocols and types of load balancers in use today
- identify desirable features in a modern load balancing solution and what functions they provide
- describe the appropriate topology to implement when introducing load balancing technologies into a system architecture
- recognize when to use a Layer 4 load balancer and their constraints and benefits
- recognize when use a Layer 7 load balancer and their constraints and benefits
- differentiate between cloud-based load balancers and traditional load balancer technologies
- differentiate between hybrid and multi-cloud models
- describe the challenges and use cases of introducing load balancing across cloud platforms
- recognize how to implement Layer 4 load balancing using Azure Load Balancer
- recognize how to implement Layer 7 load balancing using Azure Traffic Manager



## Multi-cloud Load Balancing: Load Balancing Design Strategies

### Objectives:

- describe how to apply design pattern theory to build efficient, reusable architectures
- identify the components of a network design
- describe the steps to design a network architecture
- describe where a load balancer fits into various distributed system topologies
- describe the distribution schemes used by load balancers
- outline the steps to determine the required component capacity to build an efficient network
- recognize functions available in load balancers and which of them should be considered for a network architecture
- describe the best practices to take when implementing load balancing technologies
- recognize the different methods and algorithms used in load balancing
- implement Layer 4 load balancing using AWS Network Load Balancer
- implement Layer 7 load balancing using AWS Application Load Balancer
- load balance an IIS web farm using Application Request Routing in IIS



**Charles Robinson**  
DevOps Trainer and Consultant

### Multi-cloud Load Balancing: Designing Multi & Hybrid Cloud Solutions

#### Objectives:

- describe the differences between private, public, hybrid, and multi-cloud models
- recognize opportunities and challenges of adopting cloud technologies
- describe the steps to plan for a hybrid or multi-cloud implementation
- recognize common design patterns for hybrid and multi-cloud architectures
- describe commonly used network topologies for hybrid and multi-cloud networks
- outline best practices to use when selecting a topology for a hybrid or multi-cloud topology
- describe how to utilize load balancers for disaster recovery practices in hybrid and multi-cloud scenarios
- describe common architectural practices used in hybrid and multi-cloud models
- recognize the options available for DNS routed load balancing across data centers in hybrid and multi-cloud scenarios
- design a reference architecture for a multi-cloud scenario with a combination of Layer 4 and Layer 7 load balancers
- design a reference architecture for a hybrid cloud scenario
- design a reference architecture for a hybrid cloud scenario using load balancers for disaster recovery



**Bill Brooks**  
Senior Software Developer

### Session Management in Multi-cloud & Hybrid Cloud Environments

#### Objectives:

- describe how tokens are used for session management and security concerns of session management
- describe how sticky sessions are maintained during load balancing and the benefits and challenges of sticky sessions
- describe the best practices and challenges of load balancing in multi-cloud and hybrid cloud environments
- describe how to manage a session ID using URL rewriting and hidden fields
- describe how to manage a session ID using cookies
- describe how to manage session identification using a JSON Web Token (JWT) and how a JSON Web Token is created by a session authority
- identify the fundamentals of multi-cloud solutions, including hybrid cloud, and describe their benefits and challenges
- describe the fundamentals of service meshes and how they manage user sessions
- describe best practices for multi-cloud identity management and also identify the role of SSO, MFA, zero trust, passwordless technologies, and other technologies used in multi-cloud environments
- describe the unique challenges of identity management in a hybrid cloud environment
- describe identity fabric as a strategy for identity management in multi-cloud environments and its benefits



**Bill Brooks**  
Senior Software Developer

### Considerations in Load Balancing: Multi-cloud Security Management

#### Objectives:

- describe the shared responsibility model as it applies to public cloud environments
- recognize security concepts critical to managing a multi-cloud environment
- recognize the common security challenges inherent in cloud technologies
- create a virtual network resource in Microsoft Azure
- recognize security challenges specific to multi-cloud environments
- recognize common challenges faced when an organization moves its operations to the cloud
- recognize development and operations practices that lead to operations resiliency in the cloud
- describe potential consequences of security failure in the cloud
- describe mechanisms for data backup and disaster recover in the cloud
- describe the importance of visibility and control in hybrid cloud and how this is achieved



**Bill Brooks**  
Senior Software Developer

### Considerations in Load Balancing: Multi-cloud Data & Privacy Management

#### Objectives:

- recognize the challenges of maintaining data privacy in a multi-cloud environment and some best practices to ensure data privacy
- recognize the aspects of the hybrid cloud architecture that data protection spans and identify strategies to protect data in a hybrid cloud environment
- recognize what can be done in a hybrid cloud environment to ensure data integrity and availability
- identify strategies for disaster recovery in various multi-cloud scenarios
- identify the components of a hybrid cloud security architecture and recognize the benefits and challenges of hybrid cloud security
- recognize challenges to ensuring authentication in multi-cloud and hybrid cloud environments and identify some strategies to remediate these challenges
- define federated cloud and recognize its implications for cloud data security



### Final Exam: Multi-cloud Load Balancing Principles

#### Objectives:

- describe commonly used network topologies for hybrid and multi-cloud networks
- describe how sticky sessions are maintained during load balancing and the benefits and challenges of sticky sessions
- describe how to apply design pattern theory to build efficient, reusable architectures
- describe how tokens are used for session management and security concerns of session management
- describe how to manage a session ID using URL rewriting
- describe how to manage session identification user a JWT token, and describe how a JWT token is created by a session authority
- describe how to utilize load balancers for disaster recovery practices in hybrid and multi-cloud scenarios
- describe mechanisms for data backup and disaster recovery in the cloud
- describe potential consequences of security failure in the cloud
- describe the best practices to take when implementing load balancing technologies
- describe the challenges and use cases of introducing load balancing across cloud platforms
- describe the differences between private, public, hybrid, and multi-cloud models

- describe the shared responsibility model as it applies to public cloud environments
- describe the steps to design a network architecture
- describe the steps to plan for a hybrid or multi-cloud implementation
- describe the unique challenges of identity management in a hybrid cloud environment
- describe what load balancing is, where it is used, and what forms load balancers come in
- describe where a load balancer fits into various distributed system topologies
- identify the components of a hybrid cloud security architecture and recognize the benefits and challenges of hybrid cloud security
- identify the components of a network design
- identify the different protocols and types of load balancers in use today
- identify the fundamentals of multi-cloud solutions, and describe their benefits and challenges
- recognize common challenges faced when an organization moves its operations to the cloud
- recognize opportunities and challenges of adopting cloud technologies
- recognize the advancements in load balancing technology and how to enable them in the cloud
- recognize the challenges of maintaining data privacy in a multi-cloud environment and some best practices to ensure data privacy
- recognize the common security challenges inherent in cloud technologies
- recognize what can be done in a hybrid cloud environment to ensure data integrity and availability
- recognize when to use a Layer 4 load balancer and its constraints and benefits
- recognize when using a Layer 7 load balancer and their constraints and benefits

# Track 2: Solutions for Multi-cloud Load Balancing



In this Skillssoft Aspire journey track of the Load Balancing Multi and Hybrid Cloud Solutions Journey, the focus will be on disaster and backup strategies with multi-cloud load balancing, working with load balancing and performance monitoring, load balancing strategies with Docker and Kubernetes, and comparing multi-cloud load balancing solution providers.

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## Multi-cloud Load Balancing: Disaster Backup & Recovery

### Objectives:

- describe the history of disaster backup and recovery (DBAR)
- describe the details of several single cloud load balancing strategies
- describe how responsibilities for DBAR have changed over time
- describe how data backup strategies work in Microsoft Azure
- configure data backup in Microsoft Azure
- describe how data backup strategies work in AWS
- configure data backup in AWS
- describe how data backup strategies work in GCP
- configure data backup in GCP
- describe the challenges of DBAR in cloud environments
- recall the use of load balancing for multi-cloud applications
- compare and contrast application load balancing with DBAR load balancing



## Solutions for Multi-cloud Load Balancing: Load Balancing with Docker

### Objectives:

- describe how Docker works with containers and images to package and deploy containerized apps and services and how it aligns with CI/CD and microservice patterns
- compare how Docker deployments stack up to traditional deployment types
- describe the Docker Engine, Docker client, and Docker registries
- describe Docker objects including images, containers, volumes, networks, Docker Swarm, and Docker Compose
- install, configure, and test Docker on Ubuntu Linux
- initialize a Docker swarm on Ubuntu Linux
- describe how microservices have fundamentally changed deployments and load balancing
- describe challenges specific to load balancing Docker deployments
- describe how fully managed cloud services compare to self-managed services
- describe Docker load balancing scenarios including load balancing with NGINX load balancer and using swarm mode
- describe deployment scenarios across global networks using Docker Swarm with external reverse proxy and load balancing software
- configure load balancing with swarm mode on Ubuntu Linux
- configure load balancing using an NGINX container



**Joe Khoury**  
IT / Business Expert

### Solutions for Multi-cloud Load Balancing: Load Balancing Kubernetes Solutions

#### Objectives:

- describe how Kubernetes (K8s) works with containers, images, and Pods to deploy containerized apps and services, as well as how it aligns with CI/CD and microservices
- describe Kubernetes deployments and how they stack up against traditional deployment types
- describe how Kubernetes uses nodes and clustering to run workloads
- describe Kubernetes components and architecture, including specific roles, the control plane, worker nodes, and add-ons
- describe Kubernetes objects like Pods, deployments, replicaset, daemonsets, Ingress, and services, as well as how they are created and managed using a declarative vs. imperative approach
- describe the unique clustering and load balancing challenges of Kubernetes
- describe how services are used to abstract a logical set of Pods and a policy by which to access them, as well as why this pattern is also referred to as a micro-service
- describe different network traffic management and load balancing scenarios supported in Kubernetes using Kubernetes services
- describe how Kubernetes uses Ingress to provide network traffic management and how load balancing is handled for the different types of Ingress supported by Kubernetes
- install Kubernetes on an Ubuntu Linux-based system
- bootstrap a real Kubernetes cluster with a master and three worker nodes
- configure spread topology constraints to control how Pods are spread across a cluster
- manage network traffic by configuring and applying Kubernetes network policies
- create and configure an Ingress to expose HTTP and HTTPS routes from outside the cluster to services within the cluster



**Bill Brooks**  
Senior Software Developer

### Comparing Multi-cloud Load Balancing Solutions: Load Balancer Vendors

#### Objectives:

- define hardware load balancer and describe the benefits and challenges of using hardware load balancers
- compare and contrast various hardware load balancer providers
- define virtual load balancer and describe the benefits and challenges of using virtual load balancers
- compare and contrast various virtual load balancer providers
- define cloud-based load balancer, describe the load balancer types, and describe the benefits and challenges of using cloud-based load balancers
- compare and contrast various cloud-based load balancer providers
- define failover, compare and contrast load balancing with failover, and describe the challenges of cloud failover



## Solutions for Multi-Cloud Load Balancing: Multi-cloud Performance Monitoring

### Objectives:

- outline the significance of performance monitoring on-premises and in the cloud
- describe the performance challenges introduced by multi-cloud environments
- recognize the best practices for performance monitoring on multi-cloud environments, including hybrid cloud
- describe the role of load balancers in improving performance
- describe the performance data that load balancers can provide and their benefits
- outline the concept of fail-over in multi-cloud, its relation to load balancing, and how it improves reliability
- configure Microsoft Azure geographic routing
- define the common load balancer metrics and their purposes
- describe load balancing for performance in relation to multi-cloud, including best practices and challenges
- recognize how to publish metrics on AWS CloudWatch
- monitor metrics with AWS CloudWatch



## Final Exam: Solutions for Multi-cloud Load Balancing

### Objectives:

- bootstrap a real Kubernetes cluster with 4 nodes
- compare and contrast various cloud-based load balancer providers
- compare and contrast various hardware load balancer providers
- configure data backup in AWS
- configure data backup in GCP
- configure data backup in Microsoft Azure
- define hardware load balancer and describe the benefits and challenges of using hardware load balancers
- define virtual load balancer and describe the benefits and challenges of using virtual load balancers
- demonstrate how to configure a swarm on ubuntu linux
- demonstrate how to install, configure and test docker on ubuntu linux
- demonstrate how to install Kubernetes on an ubuntu linux based system
- demonstrate network traffic management in Kubernetes using network policies
- describe basic and native docker load balancing scenarios, including load balancing with nginx load balancer and using swarm mode
- describe docker engine, docker client, docker registries
- describe docker objects including images, containers, volumes, networks, docker swarm, docker compose
- describe how fully managed cloud services compare to self-managed services
- describe how services are used to abstract a logical set of Pods and a policy by which to access them and how this pattern is also referred to as a micro-service
- describe Kubernetes components and architecture focusing on their specific roles, control plane, worker node, and discuss add-ons
- describe Kubernetes objects like pods, deployments, replicaset, daemonsets, ingress, services and how they are created and managed using a declarative versus imperative approach
- describe the best practices for performance monitoring on multi-cloud environments, including hybrid cloud
- describe the overall role of load balancers in improving performance
- describe the performance challenges introduced by multi-cloud environments
- discuss how data backup strategies work in GCP
- discuss the challenges of DBAR in cloud environments
- discuss the concept of failover in multi-cloud, how it relates to load balancing, and how it improves reliability

- discuss the history of backups, restores and disaster planning
- discuss the significance of performance monitoring on-premises and in the cloud
- monitor metrics with AWS CloudWatch
- recognize docker objects including images, containers, volumes, networks, docker swarm, docker compose
- talk about how k8s works with containers, images, and Pods to deploy containerized apps and services and how it aligns with CI/CD and microservices
- 

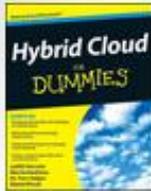
## Bookshelf Optional



BOOK 

**Practical Load Balancing:  
Ride the Performance Tiger**

 5 



BOOK 

**Hybrid Cloud for Dummies**

 10 



BOOK 

**Real-Time Push Notifications  
using Hybrid Cloud**

## Business & Leadership for Load Balancing Multi and Hybrid Cloud Solutions Optional



COURSE 

**Developing a Growth  
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 2551 



COURSE 

**Developing Your Business  
Acumen**

 742 



COURSE 

**Using Strategic Thinking to  
Consider the Big Picture**

 643 



COURSE 

**Using Active Listening in  
Workplace Situations**

 969 



COURSE 

**Choosing the Right  
Interpersonal...**

 1364 



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**Building a Culture of Design  
Thinking**

 475 



COURSE 

**Enabling Business Process  
Improvement**

 980 



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**The Essential Role of the  
Agile Product Owner**

 291 



COURSE 

**Innovating with Lean Product  
Management**

 263 



COURSE 

**Six Sigma Measurement  
System Analysis**

 201 

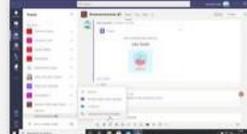
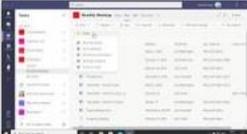
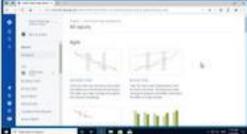


COURSE 

**Reaching Sound Conclusions**

 285 

# Productivity Tools for Load Balancing Multi and Hybrid Cloud Solutions Optional

 <p>COURSE</p> <p>Exploring and setting up Microsoft Teams</p> <p>94</p>	 <p>COURSE</p> <p>Creating and managing teams &amp; channels</p> <p>24</p>	 <p>COURSE</p> <p>Formatting, illustrating &amp; reacting to messages</p> <p>17</p>	 <p>COURSE</p> <p>Using private messaging &amp; call tools</p> <p>23</p>	 <p>COURSE</p> <p>Creating, joining, and managing meetings</p> <p>31</p>
 <p>COURSE</p> <p>Creating, finding &amp; organizing files</p> <p>24</p>	 <p>COURSE</p> <p>Working with Tabs &amp; Apps</p> <p>23</p>	 <p>COURSE</p> <p>Signing in &amp; Setting Up Slack</p> <p>29</p>	 <p>COURSE</p> <p>Using Channels in Slack</p> <p>14</p>	 <p>COURSE</p> <p>Using Private Messaging &amp; Communication Tools in...</p> <p>16</p>
 <p>COURSE</p> <p>Creating, Finding &amp; Sharing Information in Slack</p> <p>10</p>	 <p>COURSE</p> <p>Configuring Slack</p> <p>8</p>	 <p>COURSE</p> <p>Signing in &amp; Navigating within Spaces</p> <p>46</p>	 <p>COURSE</p> <p>Setting Up &amp; Managing Spaces</p> <p>36</p>	 <p>COURSE</p> <p>Working with Space</p> <p>30</p>
 <p>COURSE</p> <p>Working with Team Members</p> <p>82</p>	 <p>COURSE</p> <p>Configuring Spaces</p> <p>21</p>	 <p>COURSE</p> <p>Creating &amp; Setting Up Projects in Jira Cloud</p> <p>185</p>	 <p>COURSE</p> <p>Configuring &amp; Managing Boards in Jira Cloud</p> <p>118</p>	 <p>COURSE</p> <p>Planning &amp; Working on a Software Project in Jira...</p> <p>96</p>
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email: [biuro@skilltech.pl](mailto:biuro@skilltech.pl)

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