

Configuration Manual

MSc Research Project MSc Cybersecurity

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MSc Project Submission Sheet

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Student Name:			
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Programme:	MSc Research Project	Year:	
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Configuration Manual

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1. Introduction

This configuration manual contains step by step configuration screenshots of the tools which are included in the deployment of Multi cloud Auto scaling. It aims to provide detailed guidance on setting up and integrating resources across AWS and Azure for seamless, scalable, and secure workload management.

2. System Requirements

Hardware Specifications

- Device: Acer Aspire 3 15
- Processor: AMD RYZEN 7000 series 5
- ROM: 512GB
- RAM: 8GB

Software Specification

- Windows 11
- Terraform and Notepad
- Windows Powershell, AWS and Azure CLI
- Amazon Web Services
- Azure

3. Configuration

For auto-scaling group mlcl-asg, the desired capacity is set at 2 instances; the capability to scale the configuration allows an upper limit of 4 instances and a lower limit of 2 instances. It uses a launch template (mlcl-tmp) specifying an AMI and t2.micro instance type. The ASG is integrated with the target group (mlcl-tg) by directing traffic through load balancing to ensure high availability and resource-efficient distribution. This setup is essential for handling variable workloads dynamically while maintaining fault tolerance and scalability.

aws I iii Q Search		[Alt+S]	(9 Q	0	¢	N. Virginia 🔻	aws-cho	co 🔻
EC2 > Auto Scaling group	s > mlcl-asg						0	0	<u>5</u>
AMI Catalog	mlcl-asg								
▼ Elastic Block Store Volumes	mlcl-asg Capacity ove	rview					E	dit	
Snapshots	arn:aws:autoscaling:us-eas	t-1:180294203261:autoScalingGroup:6b601ed2-2	893-4e00-8670-d80dc5c88939:autoScalingG	roupNam	ne/mlcl-as	9			
Lifecycle Manager Vetwork & Security	Desired capacity 2	Scaling limits (Min - Max) 2 - 4	Desired capacity type Units (number of instances)		Status				
		Fig 1							

Details	Integrations - new	Automatic scaling	g Instance man	agement	Instance refresh		
Launch to	emplate						
Launch temp Launch temp lt-0329d mlcl-tmp	7a319dab64ef	AMI ID	54f44f9a4a	Instance t2.micro	Instance type t2.micro		
Version Default		Security groups -			group IDs 1a611d8f5330d5c		
-		Fig 1.	1				
Details	Integrations	- new Automatic scaling		Instan	ce management		
Load I	balancing						
Load ba mlcl-tg	lancer target groups	Cla -	ssic Load Balancer	s			

Fig 1.2

> Terraform Installed and associated with my local to run code for aws and azure using cli.



> IAM has created just to get the access and secret key to connect azure cli with terraform

Services Q Search		[Alt+S]	D & Ø \$
Identity and Access ×	IAM > Users > mlcl		
	mlcl Info		
Q Search IAM			
	Summary		
Dashboard	ARN	Console access	Access key 1
Access management	arn:aws:iam::180294203261:user/mlcl	Disabled	AKIAST6S7G56QZ4K54W5 - Active
User groups			 Never used. Created today.
Users	Created	Last console sign-in	Access key 2
Roles	November 07, 2024, 17:48 (UTC)		Create access key
Policies			
Identity providers	Tags		

Fig 3

Both aws and azure associated with terraform, meanwhile azure also get associated using subscription ID

Select	Users\VISHAK> az login the account you want ?linkid=2271136		n login with Azure CLI, see https://go.microsoft.com/f	-
Retrie	ving tenants and subsc	riptions for the selection		
[Tenan	t and subscription sel	ection]		
No	Subscription name	Subscription ID	Tenant	ros
[1] [2] * [3]	Azure for Students Azure subscription 1 IT	02d02bd4-4019-495c-9748-2167961f79f4 4f5d2f20-0bf7-4bb9-880d-85584c9be551 621b6367-31bd-45f4-a6b7-69cc621827d9	National College of Ireland	
	fault is marked with a ' (4f5d2f20-0bf7-4bb9-		ollege of Ireland' and subscription is 'Azure subscrip	
Select	a subscription and te	nant (Type a number or Enter for no ch	anges):	, _c
	: National College of iption: Azure subscrip	Ireland tion 1 (4f5d2f20-0bf7-4bb9-880d-85584c	9be551)	

Fig 4

> VPC has been created



Fig 5

> In this we can see that required features associated with VPC

100	Ir VPCs (1/2) Info							Last upda 26 minutes		Actions	•	Create V	/PC	
Q	Search								-9-		<	1 >	6	3
	Name	~	VPC ID 🗢	State	▼ Block	Public ▼	IPv4 CIDR	▼	Pv6 CIDR		∇	DHCP	optic	or
	-		vpc-0829b65af717022b5	⊘ Available	⊖ Of	f	172.31.0.0/16	-				dopt-	04cfa	3b
v	ASG-mlcl-LB-vpc		vpc-0e8df975c1403bc8a	⊘ Available	ΘOf	f	10.0.0/16	-				dopt-	04cfa	зb
														_
				_										a
	VPC Show details		Subnets (4)			Deuter	11 (4)			1000		ns (1)		
						Route t	ables (4)			Network co	onnectior			
	Your AWS virtual network		Subnets within this VPC	c			ables (4)			Network co				
				c		Route netv	work traffic to resources			Connections to c	other network			
	Your AWS virtual network ASG-mlcl-LB-vpc			с		Route netv					other network			
			Subnets within this VPO			Route netw	work traffic to resources			Connections to c	other network			
			Subnets within this VPC	bnet-public1-us-e.		Route netw rtb-0121 ASG-mlc	ec97ce7a77428			Connections to c	other network			
			Subnets within this VPO us-east-1a O ASG-mlcl-LB-sul	bnet-public1-us-e.		Route netw rtb-0121 ASG-mlc ASG-mlc	vork traffic to resources ec97ce7a77428 I-LB-rtb-public			Connections to c	other network			
			Subnets within this VPC us-east-1a SG-mlcl-LB-sul ASG-mlcl-LB-sul	bnet-public1-us-e. bnet-private1-us-e	2	Route netw rtb-0121 ASG-mlc ASG-mlc	vork traffic to resources ec97ce7a77428 I-LB-rtb-public -ILB-rtb-private2-us-ea			Connections to c	other network			

Fig 6

The subnets are distributed across multiple availability zones (AZs) within the same region (us-east-1a and us-east-1b) to ensure fault tolerance. If one AZ becomes unavailable, resources in the other AZ can continue functioning without interruption, ensuring business continuity.

Sub	nets (4/10) Info					Last updated C Actions ▼	Create subnet
Q	Find resources by attribute or tag						< 1 > 🛞
	Name 🔺	Subnet ID รนุมทศะ-บริมิตรธิดบบุชุมธิภิมษุล	▼	State	▼	VPC vpc-u829065at/1702205	▼ Block Public
	÷	subnet-09280cc44e4e2aee2		⊘ Available		vpc-0829b65af717022b5	⊖ Off
	÷	subnet-0ec324817f27d537e		⊘ Available		vpc-0829b65af717022b5	⊖ Off
1	ASG-mlc-lLB-subnet-private1-us-east-1a	subnet-0c0955be0f37819f4		⊘ Available		vpc-0e8df975c1403bc8a ASG-mlcl-LB-vpc	⊖ Off
	ASG-mlc-lLB-subnet-private2-us-east-1b	subnet-0a53dcf715a4028e5		⊘ Available		vpc-0e8df975c1403bc8a ASG-mlcl-LB-vpc	⊖ Off
	ASG-mlcl-LB-subnet-public1-us-east-1a	subnet-0504f8f65e74e2b03		⊘ Available		vpc-0e8df975c1403bc8a ASG-mlcl-LB-vpc	⊖ Off
2	ASG-mlcl-LB-subnet-public2-us-east-1b	subnet-013cb8a804b86932c		⊘ Available		vpc-0e8df975c1403bc8a ASG-mlcl-LB-vpc	⊖ Off

Fig 7

> VPC associated with subnets has been attached to Internet gateway

Internet gateways (1/2) Info			C Actions 🔻	Create internet gateway
Q Search				< 1 > 🕲
Name	▼ Internet gateway ID	▼ State	VPC ID	▼ Owner
ASG-mlc-lLB-igw	igw-03ad2a00a486f394c	⊘ Attached	vpc-0e8df975c1403bc8a	ASG-mlcl-LB 180294203261
	igw-09929fe15e6d3afd7	⊘ Attached	vpc-0829b65af717022b5	180294203261
	=			
gw-03ad2a00a486f394c / ASG	6-mlc-lLB-igw			
Details Tags				
Details				
Internet gateway ID	State	VPC ID	Owner	
igw-03ad2a00a486f394c	⊘ Attached	<u>vpc-0e8df975c140</u> <u>vpc</u>	3bc8a ASG-mlcl-LB-	0294203261
		Fig 8		

> The customer gateway here is the part of VPN which is to connect Azure with AWS.

ustomer gateways (1/3) into		C	Actions v Create cu	stomer gateway
Q Find resource by attribut	ite or tag				< 1 > 🕲
Name 🖉		▼ State	▼ BGP ASN	▼ IP address	⊽ Туре
mlcl_GW	cgw-024226a8a9ae90837	 Available 	65000	18.210.3.59	ipsec.

The virtual private gateway creates secure connection between AWS VPC and Azure VN, so the VPC ID is attached here.

Virtual private gateways (1/1) info			C Actions v Crea	te virtual private gateway
Q , Find resource by attribute or tag				< 1 > 🕲
Name 🖉 🛛 🔻 Virtual private gateway ID	▼ State	Туре	▼ VPC	
mlcl_virtual_private vgw-055e6b8aec5e55340	 Attached 	ipsec.1	vpc-0e8df975c14	03bc8a ASG 64512
)

Fig 10

➢ Finally VPN connection established in AWS

${f Q}$ Find resource by attribute or tag					< 1 > 🚱
Name 🖉 🛛 🔻 VPN II	D 🗸	State	▼ Virtual private gateway ▼	Transit gateway	
cross_cloud vpn-0	de084519979890c3	⊘ Available	vgw-055e6b8aec5e55340	-	cgw-00c56610
Azure_AWSvpn vpn-0	8e0041e03d7a9868	⊘ Available	vgw-055e6b8aec5e55340	-	cgw-067e0782
PN connection ypp. 0de094510	070800c7 / cross c	houd	=		@ ¥
PN connection vpn-0de084519	9979890c3 / cross_c	loud	-		\$ ×
PN connection vpn-0de084519 Details	9979890c3 / cross_c	loud	-		® ×
	9979890c3 / cross_c	loud	 Virtual private gateway	Customer gateway	
Details		loud		Customer gateway cgw-00c56610475	
Details	State		Virtual private gateway		
Details VPN ID I© vpn-0de084519979890c3	State ② Available		Virtual private gateway vgw-055e6b8aec5e55340	cgw-00c56610475	
Details VPN ID I© vpn-0de084519979890c3	State Available Customer gateway Cu.47.113.9		Virtual private gateway vgw-055e6b8aec5e55340 Type	cgw-00c56610475 Category	
Details VPN ID i vpn-0de084519979890c3 Transit gateway -	State ⊘ Available Customer gateway		Virtual private gateway vgw-055e6b8aec5e55340 Type ri ipsec.1	cgw-00c56610475 Category	
Details VPN ID I vpn-0de084519979890c3 Transit gateway - VPC	State State Available Customer gateway Customer gateway Routing	address	Virtual private gateway vgw-055e6b8aec5e55340 Type Cipipsec.1 Acceleration enabled	cgw-00c56610475 Category Core VPN Authentication	d06213

> In Azure, resource group ahs been created and necessary resources were also deployed.



Fig 12

Establish an Azure virtual network (mlclVN) with the right address space, for example, 10.1.0.0/16, to avoid overlapping IP address space with the AWS VPC and connect the Azure VNet to the VPN Gateway to communicate securely.

Microsoft Azure		∠ Search resources, services, and docs (G+/)		🤣 Copilot			R 🕺	23206055@student.nci ATIONAL COLLEGE OF IRELAND
lome >								
→ miciVN 🖈 ☆ … Virtual network								>
© Search \diamond «	$ ightarrow$ Move \lor 📋 Delete	C) Refresh 🖗 Give feedback						
								JSON Vie
Overview Activity log		: mld	Address space	: 10.1.0.0/16				JSON Vie
Activity log	A Essentials Resource group (move) Location (move)	: mid : East US	Address space DNS servers	: 10.1.0.0/16 : Azure provide	ed DNS service			JSON Vie
Activity log Access control (IAM)	Resource group (move)				ed DNS service			JSON Vie
	Resource group (move) Location (move)	: East US	DNS servers	: Azure provide	ed DNS service			JSON Vie

Create a route-based VPN Gateway (VpnGw2AZ) in Azure and connect it to the AWS VGW. Configure the BGP settings and Azure route table to manage traffic between Azure and AWS seamlessly.

\bigcirc Refresh \rightarrow Move \lor 📋 Delete						
∧ Essentials						
Resource group (move) : <u>mlcl</u>	SKU	: VpnGw2AZ			
Location	: East US	Gateway type	: VPN			
Subscription (move)	: Azure subscription 1	VPN type	: Route-based			
Subscription ID	: 4f5d2f20-0bf7-4bb9-880d-85584c9be551	Virtual network	: <u>mlcIVN</u>			
		Public IP address	: 20.47.113.9 (mlclIP)			

Fig 14

Local Network Gateway is the Azure endpoint managing the VPN connection to the AWS Virtual Private Gateway. Ensure proper pairing and routing to bridge the networks so Azure can communicate across cloud with AWS.

MiciLN ☆ ☆ … Local network gateway				
	$ ightarrow$ Move \lor 📋 De	lete		
🚸 Overview	∧ Essentials			
Activity log	Resource group (move)	: mld	IP address	: 18.210.3.59
Access control (IAM)	Location	: East US	Address Space(i) : 10.0.0/16, 172.31.0.0/16
🗳 Tags	Subscription (move)	: Azure subscription 1		
✓ Settings	Subscription ID	: 4f5d2f20-0bf7-4bb9-880d-85584c9be551		
	Tags (<u>edit</u>)	: Add tags		
		Fig 15		

Allows UDP traffic on port 4500 to Azure virtual network (10.1.0.0/16) from AWS CIDR block (10.0.0.0/16). Enables traffic from Azure virtual network (10.1.0.0/16) to AWS CIDR block.

Home > ♥ mlcINSG ☆ ☆ … Network security group							
	$ ightarrow$ Move \lor 📋 Delete	🕐 Refresh 🛛 🖗 Give feedback					
💎 Overview	↑ Essentials						
Activity log	Resource group (move) : m	ld.			Custom security rules : 1 inbound, 1 out	bound	
Access control (IAM)	Location : Ea	st US			Associated with : 1 subnets, 0 netv	work interfaces	
Tags		ture subscription 1					
Diagnose and solve problems Settings		5d2f20-0bf7-4bb9-880d-85584c9be55 <u>id tags</u>	1				
Inbound security rules	℅ Filter by name	Port == a	Protocol == all	Source == all	Destination == all Action == all		
Cutbound security rules	Priority 1	Name ↑↓	Port ↑↓	Protocol ↑↓	Source ↑↓	Destination ↑↓	Action ↑↓
Network interfaces	\checkmark Inbound Security Rule	s					
<-> Subnets	100	AllowCidrBlockCustom4500In	4500	UDP	10.0.0/16	10.1.0.0/16	Allow
Properties	65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
Locks	65001	AllowAzureLoadBalancerinBou-	Any	Any	AzureLoadBalancer	Any	Allow
> Monitoring	65500	DenyAllInBound	Any	Any	Any	Any	😢 Deny
> Automation	✓ Outbound Security Ru	les					
> Help	110	AllowCidrBlockCustom45000	4500	UDP	10.1.0.0/16	10.0.0/16	Allow
	65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	Ø Allow
	65001	AllowInternetOutBound	Any	Any	Any	Internet	Allow
	65500	DenyAllOutBound	Any	Any	Any	Any	😣 Deny

Fig 16

A route will forward any traffic to AWS networks (10.0.0/16) through the Virtual Network Gateway. So, Azure resources in that subnet can now communicate with AWS resources over the VPN connection.

Home > → miclRoteTable					
	\rightarrow Move \checkmark 📋 De	elete 🜔 Refresh ନ Give fe	edback		
🔽 Overview					
Activity log	Resource group (move) : <u>mlcl</u>			Associations : 1 subnet associations
Access control (IAM)	Location	: East US			
Tags	Subscription (move)	: Azure subscription 1			
X Diagnose and solve problems	Subscription ID	: 4f5d2f20-0bf7-4bb9-880d-8558	4c9be551		
✓ Settings	Tags (edit)	: Add tags			
Configuration	Routes				
* Routes	√ Search routes				
Subnets	Name	$\uparrow \downarrow$	Address prefix	↑↓	Next hop type
Properties	az_aws_route		10.0.0/16		Virtual network gateway
Locks	Subnets				
> Monitoring					
> Automation	Name	\uparrow_{\downarrow}	Address range	¢↓	Virtual network
> Help	GatewaySubnet		10.1.1.0/24		mlclVN

Fig 17

Reference

N/A.