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# **Cloud & Virtualization Class**

Lab 3 · Load Balancers

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# 1 Introduction

In this lab, we will learn how to use Azure Load Balancers. We will create a Standard Load Balancer and a Standard Load Balancer with VMSS. We will also learn how to use Azure Auto Scaling.

## 1.1 Lab Objectives

- Create a Standard Load Balancer
- Create a Standard Load Balancer with VMSS
- Use Azure Auto Scaling
- Use Azure Load Balancing Rules
- Use Azure NAT Rules
- Use Azure Outbound Rules
- Use Azure Health Probes
- Get to know Azure Application Gateway



## 2 Lab Walkthrough

### 2.1 Task 1 · Standard Load Balancer

#### 2.1.1 1. Create a virtual network with the following settings

The screenshot shows the 'Create virtual network' wizard in the Microsoft Azure portal. The page title is 'Create virtual network'. The top navigation bar includes 'Microsoft Azure', a search bar, and user profile icons. The breadcrumb navigation shows 'Home > Virtual networks > Create virtual network'. The main content area has tabs for 'Basics', 'IP Addresses', 'Security', 'Tags', and 'Review + create'. The 'Basics' tab is selected. A descriptive text explains that Azure Virtual Network (VNet) is the fundamental building block for private networks, enabling secure communication between Azure resources like VMs and external networks. It highlights benefits such as scale, availability, and isolation. A link to 'Learn more about virtual network' is provided. The 'Project details' section contains fields for 'Subscription' (set to 'Adam') and 'Resource group' (set to '(New) tp3rglb'). The 'Instance details' section contains fields for 'Name' (set to 'vnet1') and 'Region' (set to 'North Europe'). At the bottom, there are buttons for 'Review + create', '< Previous', 'Next : IP Addresses >', and 'Download a template'.

## 2.1.2 2. Deploy a virtual machine as part of the newly created virtual network resource

The screenshot shows the Azure portal interface for creating a new virtual machine. The validation has passed, and the configuration details are as follows:

Setting	Value
Resource group	tp3rglb
Virtual machine name	loadvm1
Region	North Europe
Availability options	Availability zone
Availability zone	1
Security type	Standard
Image	Windows Server 2019 Datacenter - Gen2
VM architecture	x64
Size	Standard B2s (2 vcpus, 4 GiB memory)
Username	admoun
Public inbound ports	RDP, HTTP
Already have a Windows license?	No
Azure Spot	No
<b>Disk</b>	
OS disk type	Premium SSD LRS
Use managed disks	Yes
Delete OS disk with VM	Enabled
Ephemeral OS disk	No
<b>Networking</b>	
Virtual network	vnet1
Subnet	default (10.0.0.0/24)

At the bottom, there are buttons for 'Create', '< Previous', 'Next >', 'Download a template for automation', and 'Give feedback'.

### 2.1.3 3. Deploy a second virtual machine as a part of the newly created virtual network resource

The screenshot shows the Microsoft Azure portal interface for creating a new virtual machine. The title bar says "Create a virtual machine - Microsoft Azure". The main content area is titled "Create a virtual machine" with a sub-section "Validation passed". The configuration details are as follows:

Resource group	tp3rglb
Virtual machine name	loadvm2
Region	North Europe
Availability options	Availability zone
Availability zone	1
Security type	Standard
Image	Windows Server 2019 Datacenter - Gen2
VM architecture	x64
Size	Standard B2s (2 vcpus, 4 GiB memory)
Username	admoun
Public inbound ports	RDP, HTTP
Already have a Windows license?	No
Azure Spot	No

**Disks**

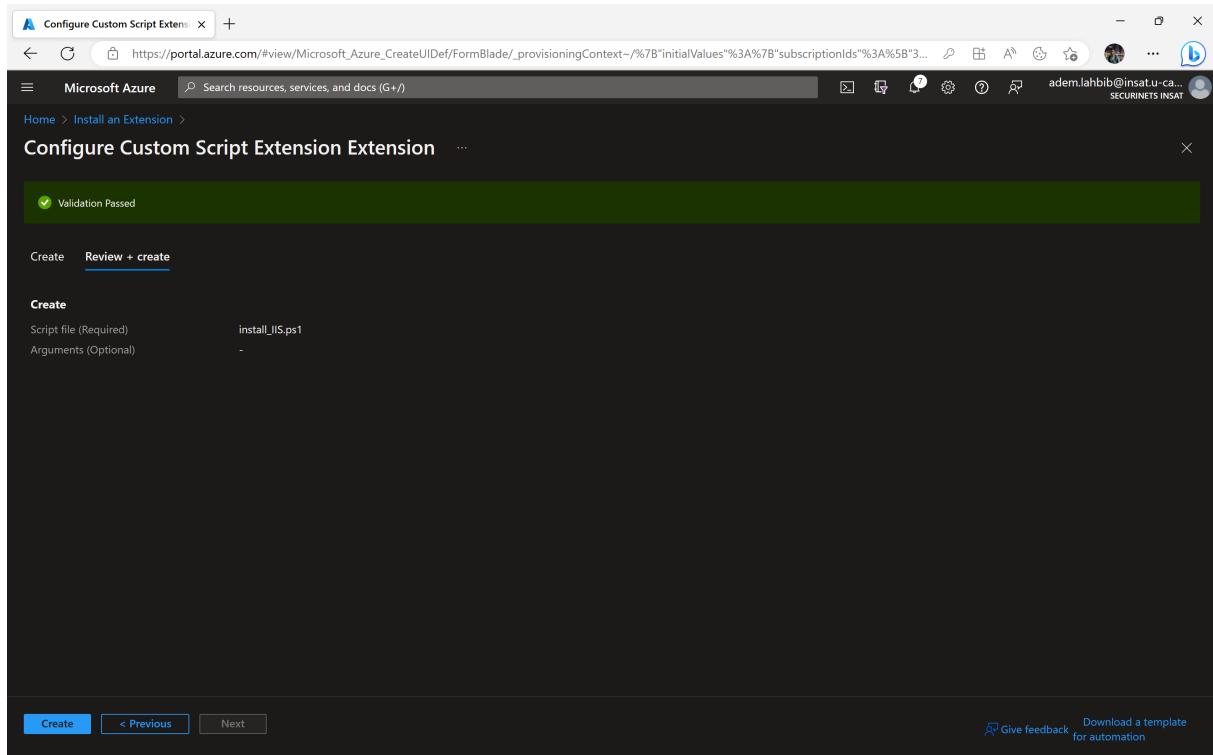
OS disk type	Premium SSD LRS
Use managed disks	Yes
Delete OS disk with VM	Enabled
Ephemeral OS disk	No

**Networking**

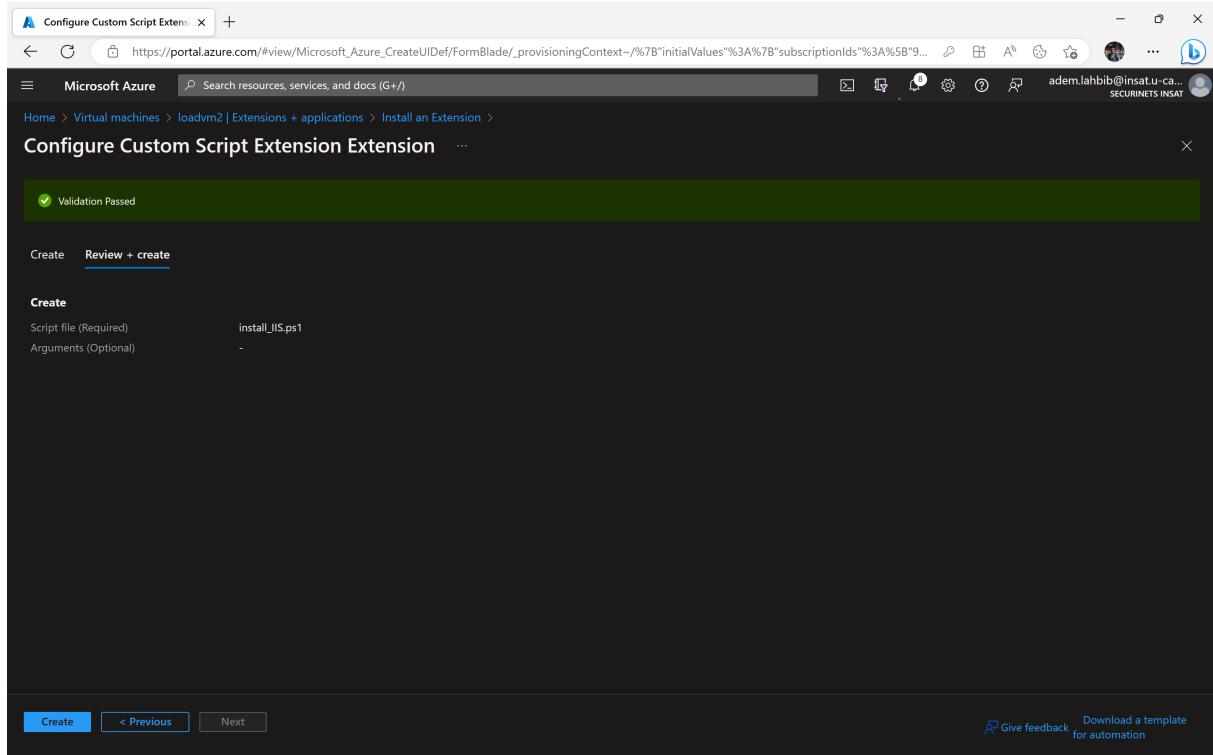
Virtual network	vnet1
Subnet	default (10.0.0.0/24)

At the bottom, there are buttons for "Create", "< Previous", "Next >", "Download a template for automation", and "Give feedback".

## 2.1.4 4. Custom Script Extensions on loadvm1



## 2.1.5 5. Custom Script Extensions on loadvm2



## 2.1.6 6. Create a Load Balancer from Azure Portal

A load balancer is a service that distributes incoming traffic across multiple targets, such as virtual machines. Load balancers are a key component of cloud computing, and are used to ensure that an application is highly available and can scale to meet demand.

Project details

Subscription: Adam

Resource group: tp3rglb

Instance details

Name: standloadbalancer

Region: North Europe

SKU: Standard

Type: Public

Tier: Regional

Review + create < Previous Next : Frontend IP configuration > Download a template for automation Give feedback

Basics Frontend IP configuration Backend pools Inbound rules Outbound rules Tags Review + create

A frontend IP configuration is an IP address used for inbound and/or outbound communication as defined within load balancing, inbound NAT, and outbound rules.

+ Add a frontend IP configuration

Name ↑↓	IP address ↑↓
loadfrontenedip	lbip (To be created)

Review + create < Previous Next : Backend pools > Download a template for automation Give feedback

A screenshot of the Microsoft Azure portal showing the 'Create load balancer' wizard. The current step is 'Backend pools'. The interface shows a table of backend pool resources:

Name	Virtual network	Resource Name	Network interface	IP address	Availability zone
PoolA	vnet1	loadvm1	loadvm1335_z1	10.0.0.4	1
PoolA	vnet1	loadvm2	loadvm282_z1	10.0.0.5	1

At the bottom, there are buttons for 'Review + create', '< Previous', 'Next : Inbound rules >', 'Download a template for automation', and 'Give feedback'.

A screenshot of the Microsoft Azure portal showing the 'Create load balancer' wizard. The current step is 'Inbound rules'. The interface shows a table of load balancing rules:

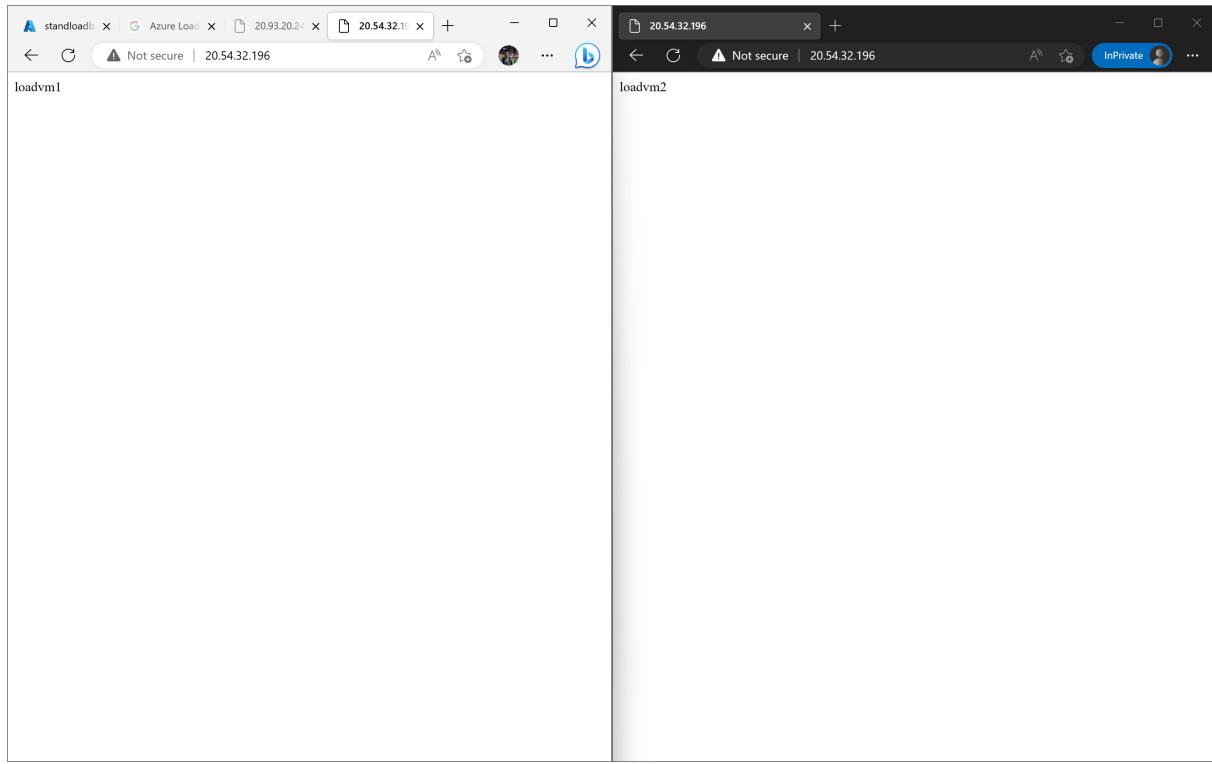
Name ↑↓	Frontend IP configuration ↑↓	Backend pool ↑↓	Health probe ↑↓	Frontend Port ↑↓	Backend port ↑↓
RuleA	loadfrontenedip	PoolA	ProbeA	80	80

Below the table, there is a section for 'Inbound NAT rule' with a note: 'An inbound NAT rule forwards incoming traffic sent to a selected IP address and port combination to a specific virtual machine.' There is a button '+ Add an inbound nat rule' and a table for adding it.

Name ↑↓	Frontend IP configuration ↑↓	Service ↑↓	Target ↑↓	Frontend Port ↑↓
Add a rule to get started				

At the bottom, there are buttons for 'Review + create', '< Previous', 'Next : Outbound rule >', 'Download a template for automation', and 'Give feedback'.

## 2.1.7 7. Testing the Load Balancer



## 2.1.8 8. Add NAT Rule for loadvml

NAT rules are used to translate a public IP address and port to a private IP address and port. This is useful for allowing remote access to a virtual machine behind a load balancer.

The screenshot shows the Azure portal interface for adding an inbound NAT rule. The URL in the address bar is [https://portal.azure.com/#view/Microsoft\\_Azure\\_Network/LoadBalancerInboundNatRulesBladeViewModelV2/loadBalancerId/%2Fsubscriptions%2F97cd8887-e...](https://portal.azure.com/#view/Microsoft_Azure_Network/LoadBalancerInboundNatRulesBladeViewModelV2/loadBalancerId/%2Fsubscriptions%2F97cd8887-e...). The top right corner shows the user's email (adem.lahbib@insat.u-ca...) and the organization (SECURINETIS INSAT).

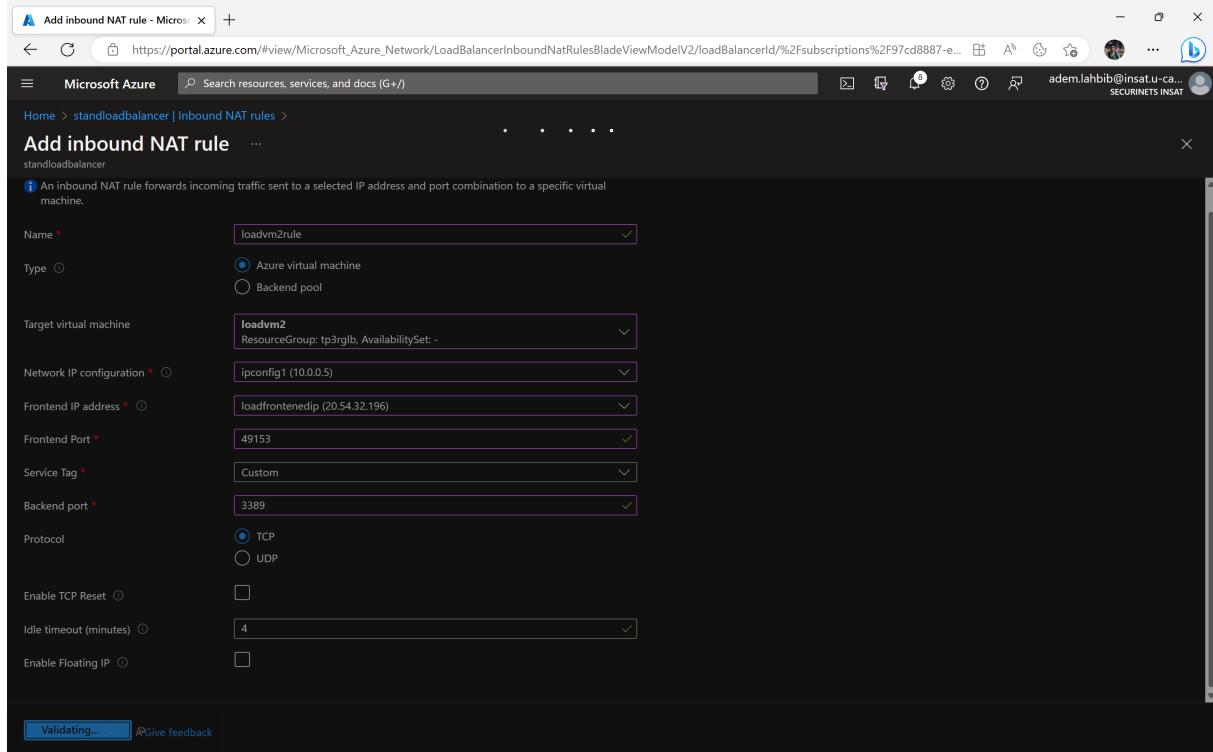
The main title is "Add inbound NAT rule" under "standloadbalancer | Inbound NAT rules". A status message at the top right says "Submitting deployment..." and "Submitting the deployment template for resource group 'tp3rglb'".

The form fields are as follows:

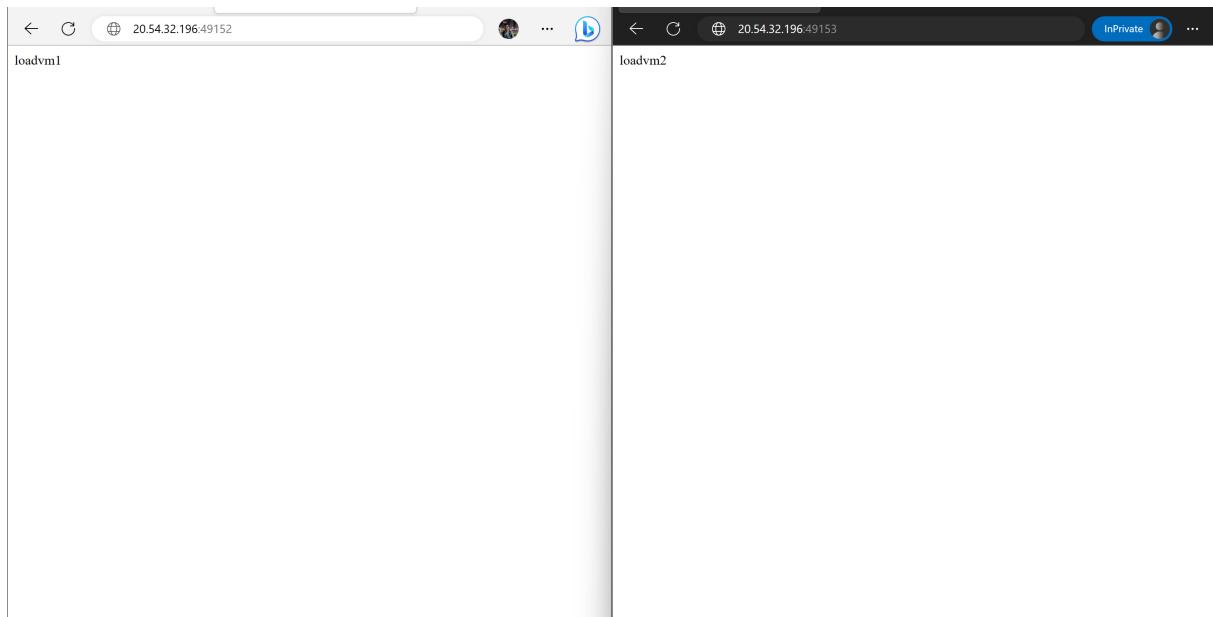
- Name \***: loadvm1rule
- Type**:  Azure virtual machine  Backend pool
- Target virtual machine**: loadvm1  
ResourceGroup: TP3RGLB, AvailabilitySet: -
- Network IP configuration**: ipconfig1 (10.0.0.4)
- Frontend IP address**: loadfrontenedip (20.54.32.196)
- Frontend Port**: 49152
- Service Tag**: Custom
- Backend port**: 3389
- Protocol**:  TCP  UDP
- Enable TCP Reset**:
- Idle timeout (minutes)**: 4
- Enable Floating IP**:

At the bottom left, there is a "Validating..." button and a "Give feedback" link.

## 2.1.9 9. Add NAT Rule for loadvm2



## 2.1.10 10. Testing the NAT Rule



## 2.1.11 11. Create a Linux VM

Name	Type	Subscription	Resource group	Location	Status	Operating system	Size	Public IP address
linuxvm	Virtual machine	Adam	tp3rglb	North Europe	Creating	Linux	Standard_D2s_v3	-
loadvm1	Virtual machine	Adam	tp3rglb	North Europe	Running	Windows	Standard_B2s	20.54.32.196
loadvm2	Virtual machine	Adam	TP3RGLB	North Europe	Running	Windows	Standard_B2s	20.54.32.196

## 2.1.12 12. SSHing into the linuxvm and installing Nginx

```

admon@linuxvm: ~ + ~
~/labs/cloud > ssh admon@20.13.161.42
The authenticity of host '20.13.161.42 (20.13.161.42)' can't be established.
EDSA key fingerprint is SHA256:L4Ggn2ipgrl902ftZmv1262wUZfqkFepTgYF8oqLMA0.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '20.13.161.42' (EDSA) to the list of known hosts.
admon@20.13.161.42's password:
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1034-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Fri Mar 24 22:20:47 UTC 2023

System load: 0.1      Processes:           119
Usage of /: 5.2% of 28.89GB  Users logged in: 0
Memory usage: 4%          IPv4 address for eth0: 10.0.0.6
Swap usage: 0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

admon@linuxvm:~$ |

```

```
admon@linuxvm:~$ curl 127.0.0.1
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
body {
    width: 35em;
    margin: 0 auto;
    font-family: Tahoma, Verdana, Arial, sans-serif;
}
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>
<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>
<p><em>Thank you for using nginx.</em></p>
</body>
</html>
admon@linuxvm:~$ |
```

### 2.1.13 13. Adding PoolB for linuxvm

The screenshot shows the Azure portal interface for creating a Backend pool. The URL is https://portal.azure.com/#view/Microsoft\_Azure\_Network/RegionalLBBackendPoolManage.ReactView/loadBalancerId/%2Fsubscriptions%2F97cd8887-e7... . The page title is "Add backend pool - Microsoft". The top navigation bar includes "Microsoft Azure", a search bar, and user information "adem.lahbib@insat.u-ca... SECURINETIS INSAT". A deployment progress notification "Deployment in progress" is visible on the right.

**Add backend pool**

Name:

Virtual network:  vnet1

Backend Pool Configuration:

- NIC
- IP address

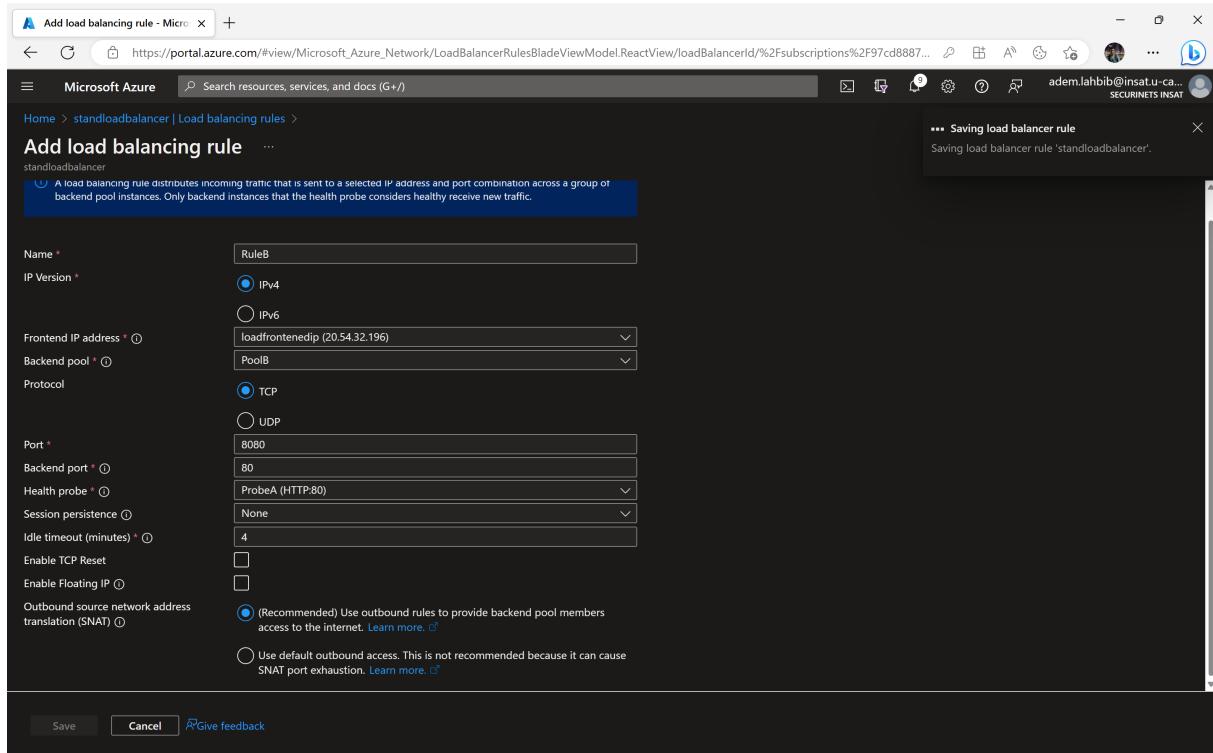
**IP configurations**

IP configurations associated to virtual machines and virtual machine scale sets must be in same location as the load balancer and be in the same virtual network.

Resource Name	Resource group	Type	IP configuration	IP Address	Availability
linuxvm	tp3rglb	Virtual machine	ipconfig1	10.0.0.6	-

Buttons: Save, Cancel, Give feedback

## 2.1.14 14. Adding Load Balancing Rule RuleB



## 2.1.15 15. Testing the Load Balancer now

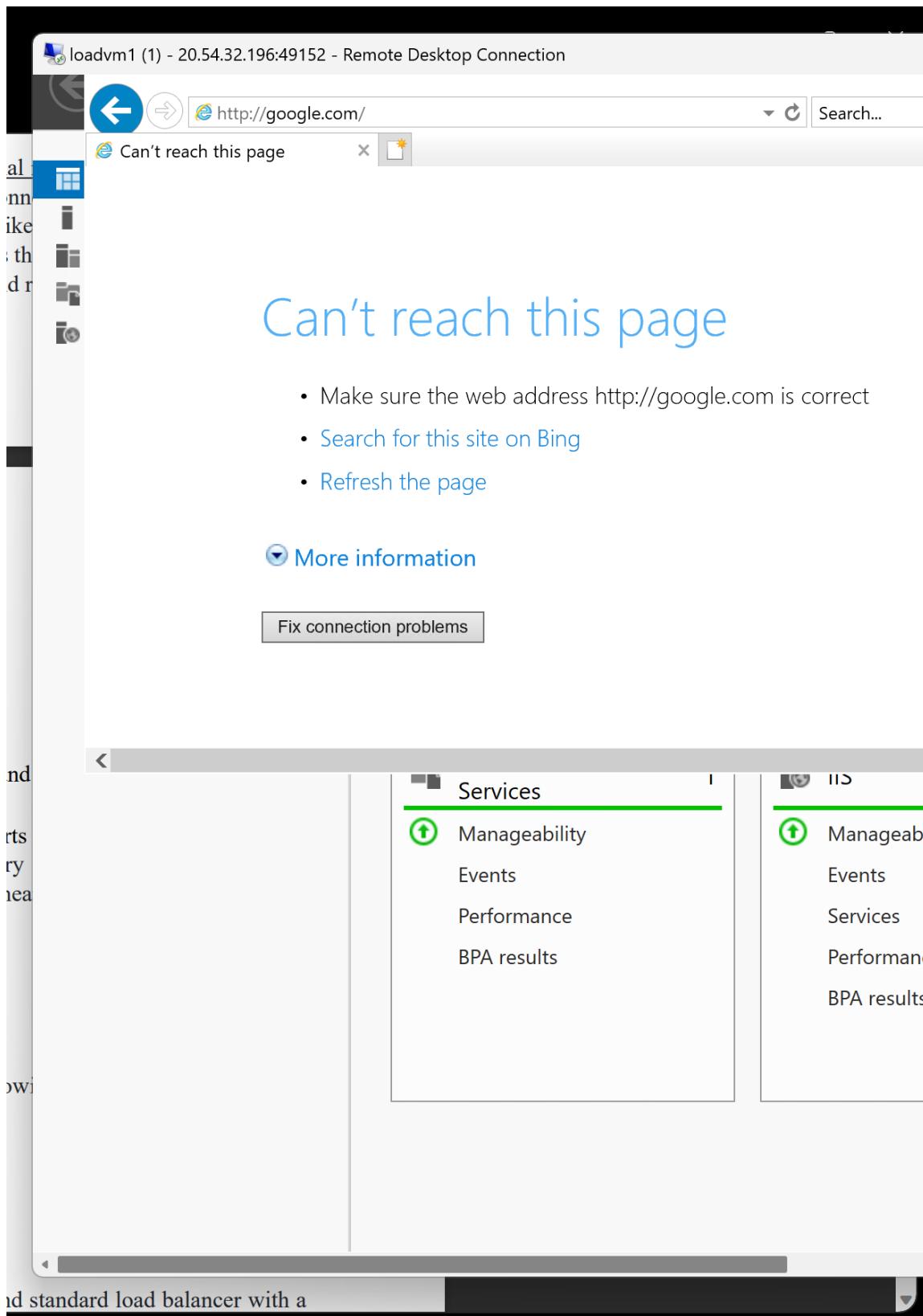


## 2.1.16 16. Remove loadvm2 from PoolA

Backend pool	Resource Name	Resource Status	IP address	Network interface	Availability zone	Rules count
PoolA (1)	loadvm1	Running	10.0.0.4	loadvm1335_z1	1	1
PoolB (1)	linuxvm	Running	10.0.0.6	linuxvm314_z1	1	1

## 2.1.17 17. Outbound Rules

First:



### Adding Outbound Rule:

The screenshot shows the Azure portal interface for adding an outbound rule. The URL is https://portal.azure.com/#view/Microsoft\_Azure\_Network/LoadBalancerOutboundRulesBladeViewModel/loadBalancerId/%2Fsubscriptions%2F97cd8887-... . The page title is "Add outbound rule - Microsoft". The top navigation bar includes "Microsoft Azure", a search bar, and user information (adem.lahbib@insat.u-ca... SECURINETS INSAT). A progress bar at the top right indicates "... Initializing deployment... Initializing template deployment to resource group 'tp3rglb'".

**Add outbound rule** (standloadbalancer)

Idle timeout (minutes): 4 (Max: 100)

TCP Reset: Enabled (radio button selected)

Backend pool: PoolA (1 instances) (dropdown menu)

**Port allocation**

Azure automatically assigns the number of outbound ports to use for source network address translation (SNAT) based on the number of frontend IP addresses and backend pool instances. [Learn more about outbound connectivity](#).

Port allocation: Manually choose number of outbound ports (dropdown menu)

**Outbound ports**

Choose by: Ports per instance (dropdown menu)

Ports per instance: 16 (dropdown menu)

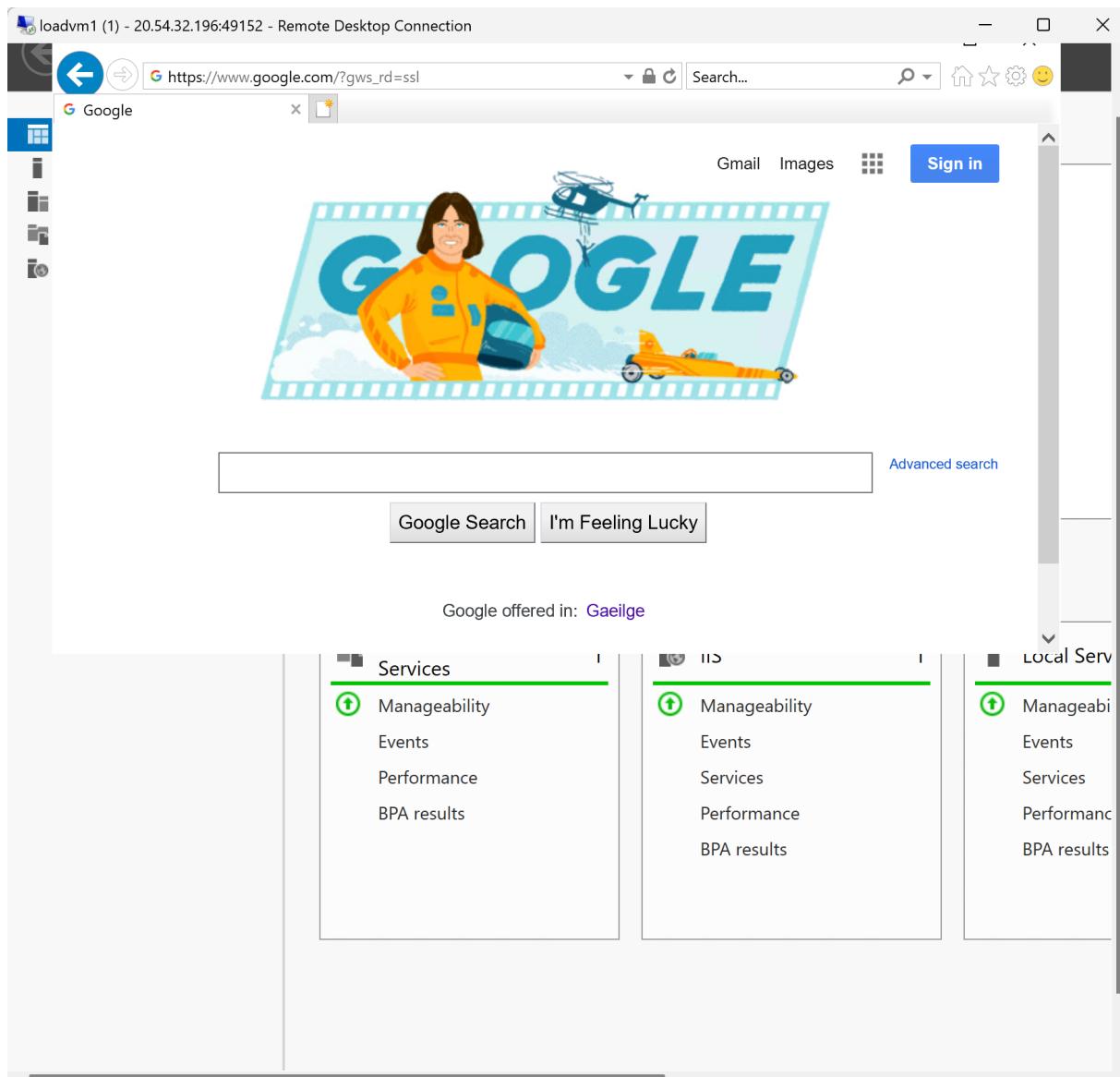
Available frontend ports: 63976

Maximum number of backend instances: 1000 (radio button)

! The maximum number of backend instances cannot be more than 1000.

Buttons at the bottom: "Validating..." (button), "Give feedback" (link).

Then:



### 2.1.18 18. Delete Resource Group

The screenshot shows the Azure portal interface for a resource group named 'tp3rglb'. A modal dialog at the top right indicates that 'Deleting resource group tp3rglb' is in progress. The main content area displays the 'Essentials' section, which includes information about the subscription (Subscription ID: 97cd8887-e707-4ecb-8c73-4eef77a13527, Owner: Adam), deployments (25 Succeeded), and location (North Europe). Below this, the 'Resources' section lists 18 resources, including an Azure Storage account, several Public IP addresses, Virtual machines, Network security groups, and Network interfaces, all located in North Europe. The resources listed are: azureadmlab3 (Storage account, East US), libip (Public IP address, North Europe), linuxvm (Virtual machine, North Europe), linuxvm-ip (Public IP address, North Europe), linuxvm-nsg (Network security group, North Europe), and linuxvm314\_z1 (Network Interface, North Europe).

## 2.2 Task 2 · Standard Load Balancer and VMSS

VMSS is a feature of Azure that allows you to create a group of identical VMs. You can then scale up or down the number of VMs in the group. This is useful for applications that need to scale up or down based on demand.

Auto Scaling is a feature of Azure that allows you to automatically scale up or down the number of VMs in a VMSS based on demand.

## 2.2.1 1. Create a virtual machine scale set VMSS

Validation passed

Size: Standard B2s (2 vcpus, 4 GiB memory)

Security type: Standard

Username: admoun

Spot: Azure Spot: No

Instance: Initial instance count: 1, Already have a Windows license?: No

Disks: OS disk type: Premium SSD LRS, Use managed disks: Yes, Ephemeral OS disk: No

Networking: Virtual network: (New) tp3rgvmss-vnet (recommended), Network interfaces: tp3rgvmss-vnet-nic01, Load balancing: Yes

Management: Create, < Previous, Next >, Download a template for automation, Give feedback

## 2.2.2 2. Make sure all instances are running

The screenshot shows the Microsoft Azure portal interface for managing a Virtual Machine Scale Set. The left sidebar shows the navigation path: Home > Virtual machine scale sets > scaleset. The main content area is titled "scaleset | Instances" and displays a table of virtual machine instances. The table has columns for Instance, Computer name, Status, Protection policy, Provisioning state, and Health state. One instance, "scaleset\_0", is listed with a status of "Running" and a provisioning state of "Succeeded". The left sidebar also includes sections for Overview, Activity log, Access control (IAM), Tags, and Settings, with "Instances" currently selected.

Instance	Computer name	Status	Protection policy	Provisioning state	Health state
scaleset_0	scaleset000000	Running		Succeeded	

### 2.2.3 3. Add custom script extension to VMSS and upgrading instances

The screenshot shows the Microsoft Azure portal interface for managing a Virtual Machine Scale Set (VMSS). The left sidebar navigation bar includes 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', and a 'Settings' section with options like 'Instances', 'Networking', 'Scaling', 'Disks', 'Operating system', 'Microsoft Defender for Cloud', 'Guest + host updates', 'Size', 'Extensions + applications', 'Continuous delivery', 'Configuration', 'Upgrade policy', 'Health and repair', and 'Identity'. The main content area displays a table titled 'Search virtual machine instances' with columns: Instance, Computer name, Status, Protection policy, Provisioning state, Health state, and Latest model. A single row is shown for 'scaleset\_0', which has a status of 'Updating (Running)' and a protection policy of 'Updating'. The URL in the browser is https://portal.azure.com/#@securinets.tn/resource/subscriptions/97cd8887-e707-4ecb-8c73-4eef77a13527/resourceGroups/tp3rgvmsss/providers/Microsoft.Compute/virtualMachineScaleSets/scaleset\_0/instances.

## 2.2.4 4. Add Inbound Security Rule to allow traffic on port 80

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with navigation links like Home, Virtual machine scale sets, scaleset, Create, Edit columns, and a search bar. The main area is titled "scaleset | Networking" and shows a list of network interfaces: tp3rgvmss-vnet-nic01, tp3rgvmss-vnet-nic01-defaultIpConfig, and tp3rgvmss-vnet-nic01. Under "Networking", the "Inbound port rules" section is selected. A modal window titled "Add inbound security rule" is open, showing the configuration for a new rule:

- Source:** Any
- Source port ranges:** \* (unchecked)
- Destination:** Any
- Service:** Custom
- Destination port ranges:** 80 (checked)
- Protocol:** Any (radio button selected)
- Action:** Allow (radio button selected)
- Priority:** 100
- Name:** AllowAnyCustom80Inbound

At the bottom of the modal are "Add" and "Cancel" buttons.

Test:



## 2.2.5 5. Auto Scaling

**Scale rule**

Selected values. Not evaluate the metric for each values individually.

Autoscale setting name: scaleset-Autoscale-349

Resource group: tp3rgvms

Predictive autoscale: Mode: Disabled

Percentage CPU (Maximum): 26.78 %

Enable Forecast only or Predictive autoscale:

Operator: Greater than

Metric threshold to trigger scale action: 0

Duration (minutes): 1

Time grain (minutes): 1

Delete warning: The very last or default recurrence rule cannot be off autoscale.

Scale mode: Scale based on a metric

Rules: Scale is based on metric trigger rules but no rule is defined. If no rule is defined, the resource will be set to default.

Instance limits: Minimum: 1, Maximum: 3

Schedule: This scale condition is executed when none of the scheduled times are met.

Action: Operation: Increase count by 1, Cool down (minutes): 5

+ Add a scale condition

New! Autoscale has added another powerful feature. Predictive autoscale. Learn more about Predictive autoscale.

Configure Scale-In Policy Predictive charts Run history JSON Notify Diagnostic settings

Choose how to scale your resource

Manual scale: Maintain a fixed instance count

Custom autoscale: Scale on any schedule, based on any metrics

Custom autoscale

Autoscale setting name: scaleset-Autoscale-440

Resource group: tp3rgvms

Instance count: 1

Predictive autoscale: Mode: Disabled

Pre-launch setup of instances (minutes): 0

Enable Forecast only or Predictive autoscale:

Default: Auto created default scale condition

Here I had to enable Microsoft.Insights in my subscription in order to create the autoscale settings and save!

## 2.2.6 6. New Instances and PoolVMSS

### Checking Instances

Instance	Computer name	Status	Protection policy	Provisioning state	Health state	Latest model
scaleset_0	scaleset000000	Running	Succeeded			Yes
scaleset_1	scaleset000001	Creating (Running)	Creating			Yes

A new instance has been created!

Backend pool	Resource Name	Resource Status	IP address	Network interface	Availability zone	Rules count	
PoolVMSS (2)	PoolVMSS	scaleset (instance 0)	Running	10.0.0.4	tp3rgvmss-vnet-nic01	-	1
	PoolVMSS	scaleset (instance 1)	Creating (Running)	10.0.0.5	tp3rgvmss-vnet-nic01	-	1

Also, in the PoolVMSS, we can see that the new instance has been added to the pool.

Name	Frontend IP	Frontend port/range	Target	Service
natpool.0	20.234.81.63	50000	scaleset (instance 0)	RDP (TCP/3389)
natpool.1	20.234.81.63	50001	scaleset (instance 1)	RDP (TCP/3389)

As well as the Inbound NAT Rules.

## 2.2.7 7. Delete Resource Group

The screenshot shows the Microsoft Azure portal interface. The user is navigating through the 'Resource groups' section under the 'tp3rgvmss' resource group. A modal window titled 'Deleting resource group tp3rgvmss' is open, indicating the current action. The main pane displays the 'Essentials' and 'Resources' sections. The 'Essentials' section shows the subscription details (Adam, 97cd8887-e707-4ecb-8c73-4eef77a13527), deployment status (3 Succeeded), and location (North Europe). The 'Resources' section lists six resources: 'azureadmlab' (Storage account, East US), 'basicNsgtp3rgvmss-vnet-nic01' (Network security group, North Europe), 'scaleset' (Virtual machine scale set, North Europe), 'scaleset-ip' (Public IP address, North Europe), 'scaleset-lb' (Load balancer, North Europe), and 'tp3rgvmss-vnet' (Virtual network, North Europe). The portal URL in the browser is https://portal.azure.com/#@securinets.tn/resource/subscriptions/97cd8887-e707-4ecb-8c73-4eef77a13527/resourceGroups/tp3rgvmss/overview.

## 2.3 Task 3 • Azure Application Gateway

### 2.3.1 1. Create a VNET

The screenshot shows the Microsoft Azure portal interface for creating a virtual network. The page title is "Create virtual network - Microsoft Azure". The URL is https://portal.azure.com/#create/Microsoft.VirtualNetwork-ARM. The top navigation bar includes "Microsoft Azure", a search bar, and user information (adem.lahbib@insat.u-ca... SECURINETIS INSAT). The main content area is titled "Create virtual network". A green validation bar at the top says "Validation passed". Below it, there are four tabs: Basics, IP Addresses, Security, and Tags. The "Review + create" tab is selected. The "Basics" section shows the following configuration:

Subscription	Adam
Resource group	(new) tp3rgag
Name	vnet1
Region	North Europe

The "IP addresses" section shows:

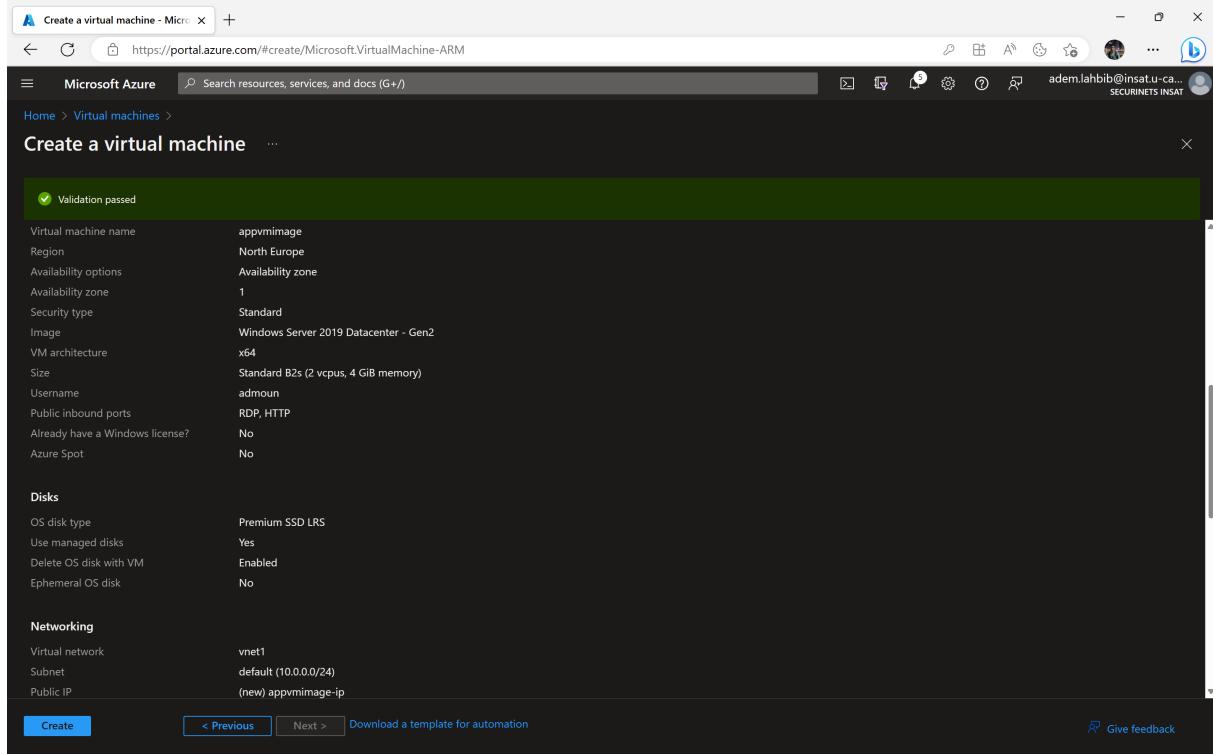
Address space	10.0.0.0/16
Subnet	default (10.0.0.0/24), appSubnet (10.0.1.0/24)

The "Tags" section shows "None". The "Security" section shows:

ActionHost	Disabled
DDoS protection plan	Basic
Firewall	Disabled

At the bottom, there are buttons for "Create" (highlighted in blue), "< Previous", "Next >", and "Download a template for automation".

### 2.3.2 2. Create 2 VMs



Virtual machine name: appvmimage  
Region: North Europe  
Availability options: Availability zone  
Availability zone: 1  
Security type: Standard  
Image: Windows Server 2019 Datacenter - Gen2  
VM architecture: x64  
Size: Standard B2s (2 vcpus, 4 GiB memory)  
Username: admoun  
Public inbound ports: RDP, HTTP  
Already have a Windows license?: No  
Azure Spot: No

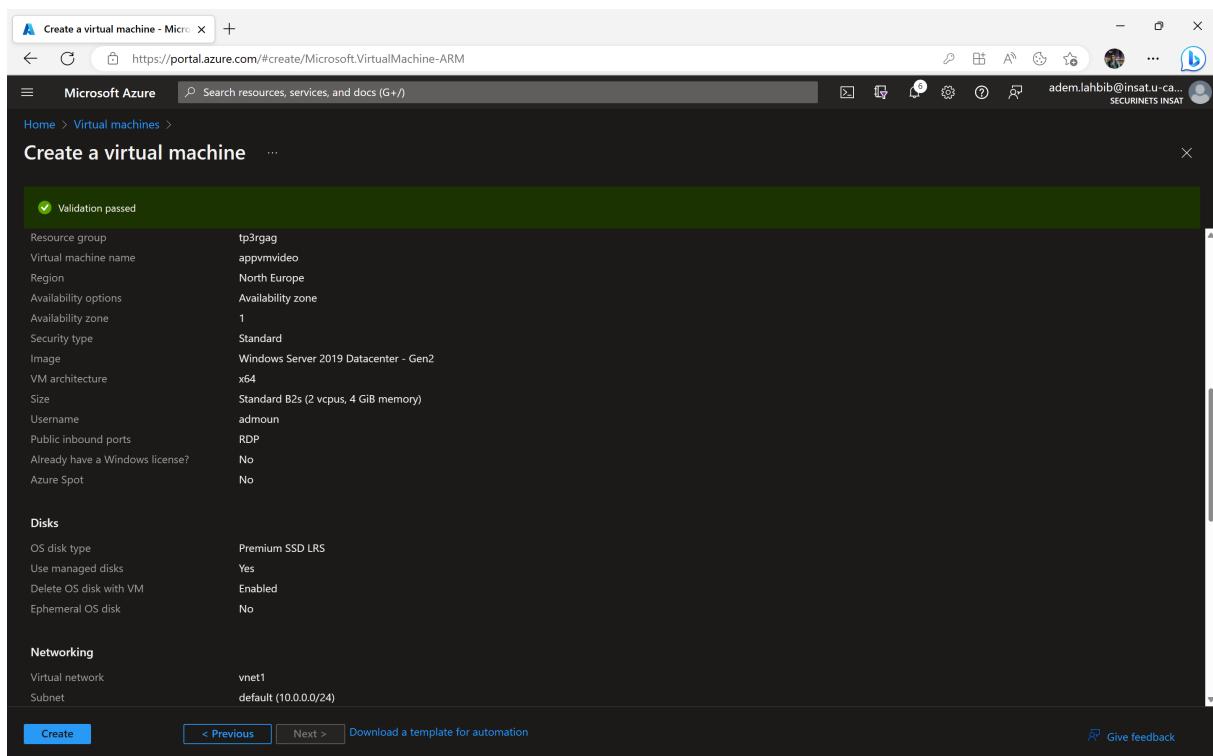
Disks

OS disk type: Premium SSD LRS  
Use managed disks: Yes  
Delete OS disk with VM: Enabled  
Ephemeral OS disk: No

Networking

Virtual network: vnet1  
Subnet: default (10.0.0.0/24)  
Public IP: (new) appvmimage-ip

Create < Previous Next > Download a template for automation Give feedback

Resource group: tp3rag  
Virtual machine name: appvmvideo  
Region: North Europe  
Availability options: Availability zone  
Availability zone: 1  
Security type: Standard  
Image: Windows Server 2019 Datacenter - Gen2  
VM architecture: x64  
Size: Standard B2s (2 vcpus, 4 GiB memory)  
Username: admoun  
Public inbound ports: RDP  
Already have a Windows license?: No  
Azure Spot: No

Disks

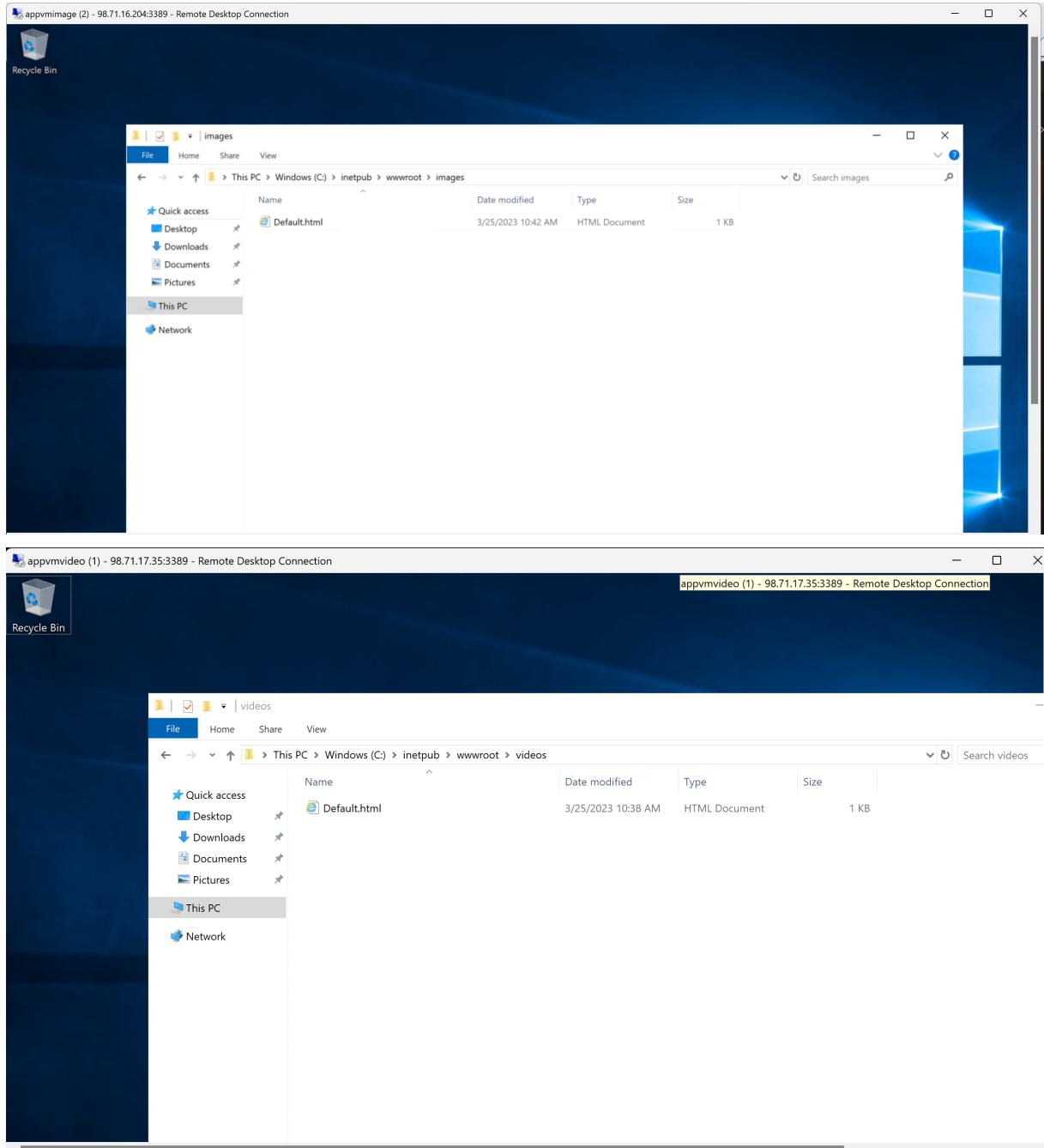
OS disk type: Premium SSD LRS  
Use managed disks: Yes  
Delete OS disk with VM: Enabled  
Ephemeral OS disk: No

Networking

Virtual network: vnet1  
Subnet: default (10.0.0.0/24)

Create < Previous Next > Download a template for automation Give feedback

### 2.3.3 3. Adding html files to the IIS Server



### 2.3.4 4. Create an Application Gateway

An application gateway is a service that provides load balancing, web application firewall, and URL-based routing for web applications. It is a Layer 7 load balancer.

The screenshot shows the 'Create application gateway' wizard in the Azure portal. The current step is 'Basics'. The user has selected 'appgateway' as the application gateway name, 'North Europe' as the region, and 'Standard V2' as the tier. They have chosen 'No' for enable autoscaling and set the instance count to 1. Under 'Configure virtual network', they have selected 'vnet1' as the virtual network and 'appSubnet (10.0.1.0/24)' as the subnet. A warning message at the top states: 'Changes you make on this tab may affect any configuration you've done on other tabs. Review all options prior to creating the application gateway.'

**Subscription:** Adam  
**Resource group:** tp3rgag

**Instance details:**

- Application gateway name:** appgateway
- Region:** North Europe
- Tier:** Standard V2
- Enable autoscaling:** No
- Instance count:** 1
- Availability zone:** None
- HTTP2:** Disabled

**Configure virtual network:**

- Virtual network:** vnet1
- Subnet:** appSubnet (10.0.1.0/24)

**Next steps:** Previous | Next : Frontends >

**Create application gateway - Microsoft Azure**

https://portal.azure.com/#create/Microsoft.ApplicationGateway-ARM

Microsoft Azure Search resources, services, and docs (G+)

Home > Load balancing | Application Gateway > Create application gateway

Basics Frontends Backends Configuration Tags Review + create

A backend pool is a collection of resources to which your application gateway can send traffic. A backend pool can contain virtual machines, virtual machine scale sets, app services, IP addresses, or fully qualified domain names (FQDN).

Add a backend pool

Backend pool	Targets	...
imagespool	▼ 1 target appvmimage61_z1	...
videospool	▼ 1 target appvmvideo11_z1	...

Previous Next : Configuration >

**Add a routing rule - Microsoft Azure**

https://portal.azure.com/#create/Microsoft.ApplicationGateway-ARM

Microsoft Azure Search resources, services, and docs (G+)

Home > Load balancing | Application Gateway > Create application gateway

Basics Frontends Backends Configuration Tags Review

Create routing rules that link your frontend(s) and backend(s). You can also add more backend pools.

Frontends

Public (new) agip

+ Add a frontend IP

...  
...

Add a routing rule

Configure a routing rule to send traffic from a given frontend IP address to one or more backend targets. A routing rule must contain a listener and at least one backend target.

Rule name \* RuleA

Priority \* 1

Listener \* Backend targets

A listener "listens" on a specified port and IP address for traffic that uses a specified protocol. If the listener criteria are met, the application gateway will apply this routing rule.<sup>1</sup>

Listener name \* Listener

Protocol \* HTTP

Frontend IP \* Port \* 80

Additional settings

Listener type \* Basic

Error page url Yes No

Previous Next : Tags > Add Cancel

**Add a routing rule - Microsoft Azure**

https://portal.azure.com/#create/Microsoft.ApplicationGateway-ARM

Microsoft Azure Search resources, services, and docs (G+)

Home > Load balancing | Application Gateway > Create application gateway ...

Basics Frontends Backends Configuration Tags Review

Create routing rules that link your frontend(s) and backend(s). You can also add more backend pool.

**Frontends**

+ Add a frontend IP

Public: (new) agip

**Configuration**

Rule name \* RuleA

Priority \* 1

Listener Backend targets

Choose a backend pool to which this routing rule will send traffic. You will also need to specify a set of Backend settings that define the behavior of the routing rule.

Target type Backend pool Redirection

Backend target \* imagespool

Backend settings \* commonsetting

Path-based routing

You can route traffic from this rule's listener to different backend targets based on the URL path of the request. You can also apply a different set of Backend settings based on the URL path.

Path	Target name	Backend setting name	Backend pool
/images/*	imagetarget	commonsetting	imagespool
/videos/*	videotarget	commonsetting	videospool

Add multiple targets to create a path-based rule

Previous Next : Tags > Add Cancel

**Create application gateway - Microsoft Azure**

https://portal.azure.com/#create/Microsoft.ApplicationGateway-ARM

Microsoft Azure Search resources, services, and docs (G+)

Home > Load balancing | Application Gateway > Create application gateway ...

Validation passed

Basics Frontends Backends Configuration Tags Review + create

**Basics**

Subscription	Adam
Resource group	tp3rgag
Name	appgateway
Region	North Europe
Tier	Standard_v2
Enable autoscaling	Disabled
Instance count	1
Availability zone	None
HTTP2	Disabled
Virtual network	vnet1
Subnet	appSubnet (10.0.1.0/24)
Subnet address space	10.0.1.0/24

**Frontends**

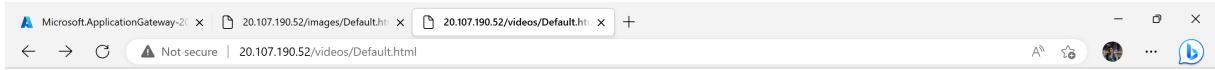
Public IP address name	agip
SKU	Standard
Assignment	Static
Availability zone	None

Create Previous Next Download a template for automation

### 2.3.5 5. Testing the Application Gateway



This is the images server



This is the videos server

## 2.3.6 6. Delete Resource Group

The screenshot shows the Microsoft Azure portal interface. On the left, the 'Resource groups' blade is open, displaying a list of existing resource groups: NetworkWatcherRG, tp3rg, and tp3rgag. The 'tp3rgag' group is selected. On the right, a detailed view of the 'tp3rgag' resource group is shown, including its subscription information (Subscription ID: 97cd8887-e707-4ecb-8c73-4eef77a13527, Owner: Adam), tags, and a list of resources. A modal dialog box titled 'Are you sure you want to delete "tp3rgag"?' is displayed, warning the user that the action is irreversible and will delete the resource group and all its resources. The 'Delete' button is visible at the bottom of the modal.

Name	Type	Location
agip	Public IP address	North Europe
appgateway	Application gateway	North Europe
appvmimage	Virtual machine	North Europe
appvmimage_OsDisk_1_b0d4...	Disk	North Europe
appvmimage61_z1	Network interface	North Europe
appvmimage713_z1	Network interface	Korea Central
appvmimage-ip	Public IP address	Korea Central
appvmimage-ip880	Public IP address	North Europe
appvmimage-nsg	Network security gr...	Korea Central
appvmimage-nsg295	Network security gr...	North Europe
appvmimage-vnet	Virtual network	Korea Central
appvmvideo	Virtual machine	North Europe

## **3 Conclusion**

This lab helps us to understand the different types of load balancers and how to configure them. We also learned how to create a VMSS and how to configure auto scaling. Finally, we learned how to create an Application Gateway and how to configure it.

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