

# Introduction to Cloud Computing

## LAB 04

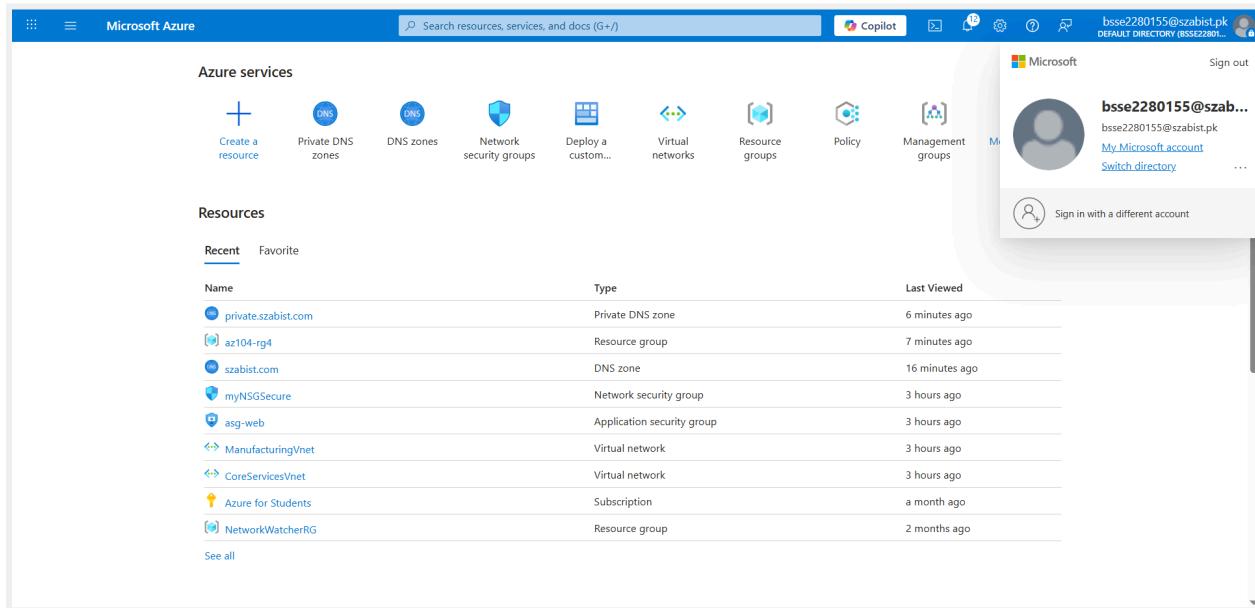
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BS-SE 7B

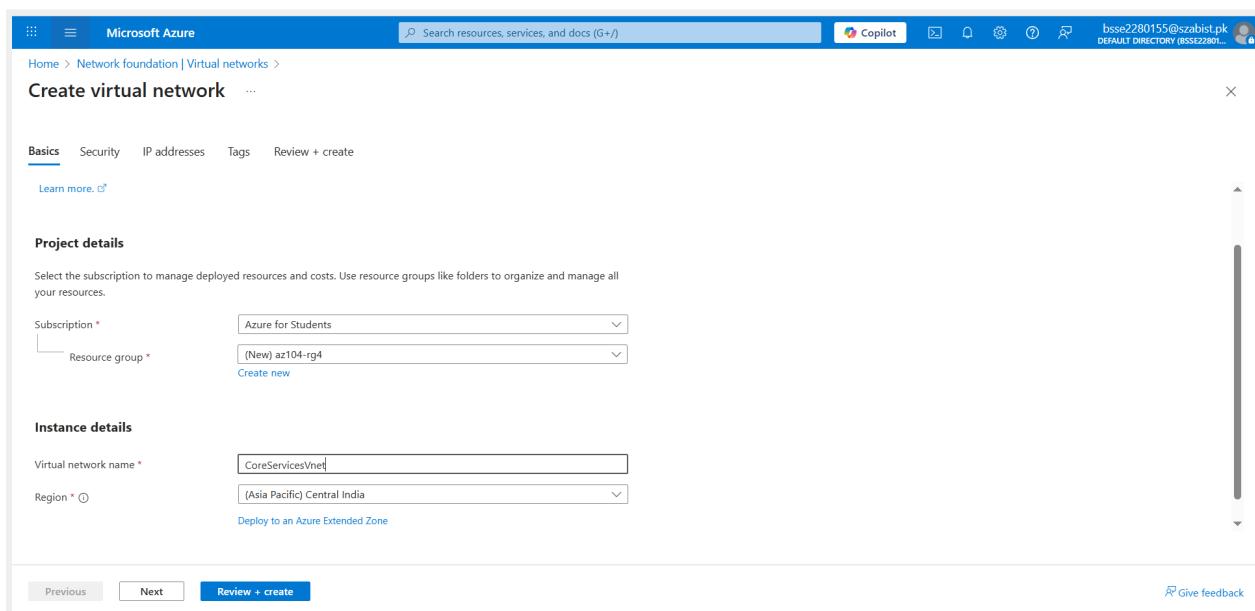
### Task 1: Create a virtual network with subnets using the portal

- Sign in to the Azure portal.



The screenshot shows the Microsoft Azure portal homepage. In the top navigation bar, there is a search bar labeled "Search resources, services, and docs (G+)" and several icons including Copilot, Home, Notifications, Settings, and Help. On the right side, a user profile is displayed with the email "bsse2280155@szabist.pk" and the text "DEFAULT DIRECTORY (BSSE22801...)" followed by a lock icon. Below the profile, there are links for "My Microsoft account" and "Switch directory". A "Sign out" button is also present. The main content area is titled "Azure services" and "Resources". Under "Resources", the "Recent" tab is selected, showing a list of recent resources including "private.szabist.com" (Private DNS zone), "az104-rg4" (Resource group), "szabist.com" (DNS zone), "myNSGSecure" (Network security group), "asg-web" (Application security group), "ManufacturingVnet" (Virtual network), "CoreServicesVnet" (Virtual network), "Azure for Students" (Subscription), and "NetworkWatcherRG" (Resource group). Each item has a small icon and a timestamp indicating when it was last viewed. At the bottom of the list, there is a link "See all".

- Search for and select **Virtual Network**.
- Select **Create** on the Virtual networks page.



The screenshot shows the "Create virtual network" wizard page. The top navigation bar includes a back arrow, the text "Home > Network foundation | Virtual networks >", a search bar, and the user profile "bsse2280155@szabist.pk". The page title is "Create virtual network" with a "..." button. Below the title, there are tabs for "Basics", "Security", "IP addresses", "Tags", and "Review + create". A "Learn more" link is also present. The "Basics" tab is selected. The "Project details" section contains fields for "Subscription" (set to "Azure for Students") and "Resource group" (set to "(New) az104-rg4"). There is also a "Create new" link. The "Instance details" section includes fields for "Virtual network name" (set to "CoreServicesVnet") and "Region" (set to "(Asia Pacific) Central India"). Below these fields is a link "Deploy to an Azure Extended Zone". At the bottom of the page, there are buttons for "Previous", "Next", and "Review + create", along with a "Give feedback" link.

- Move to the IP Addresses tab.
- Select Add a subnet.

The screenshot shows the Microsoft Azure portal interface for creating a virtual network. On the left, the 'IP addresses' tab is selected under the 'Create virtual network' wizard. On the right, a modal dialog titled 'Add a subnet' is open, allowing configuration of a new subnet. Key settings include:

- Subnet purpose:** Default
- Name:** default
- IPv4:** Selected (checkbox checked)
- IPv4 address range:** 10.20.0.0/16 (dropdown set to 10.20.0.0/16)
- Starting address:** 10.20.9.0
- Size:** /24 (256 addresses)
- Subnet address range:** 10.20.9.0 - 10.20.9.255
- IPv6:** Not selected (checkbox unchecked)
- Private subnet:** Described as enhancing security by not providing default outbound access.

The main interface shows two existing subnets: 'SharedServicesSubnet' and 'DatabaseSubnet', both with /24 size and 256 addresses.

- Select Review + create.

The screenshot shows the Microsoft Azure 'Deployment' overview page for a completed deployment named 'CoreServicesVnet-1767692178367'. The deployment status is marked as 'Deployment succeeded'. Key details from the deployment summary table:

Deployment name	CoreServicesVnet-1767692178367	Subscription	Azure for Students	Resource group	az104-rg4
Start time	1/6/2026, 2:36:23 PM	Correlation ID	84530324-d685-4430-b53c-0c037d54b911		

The page also includes sections for 'Deployment details', 'Next steps', and links to 'Cost management', 'Microsoft Defender for Cloud', 'Free Microsoft tutorials', and 'Work with an expert'.

- Wait for the virtual network to deploy and then select Go to resource.

- In the **Automation** section, select **Export template**, and then wait for the template to be generated.
  - **Download** the template.

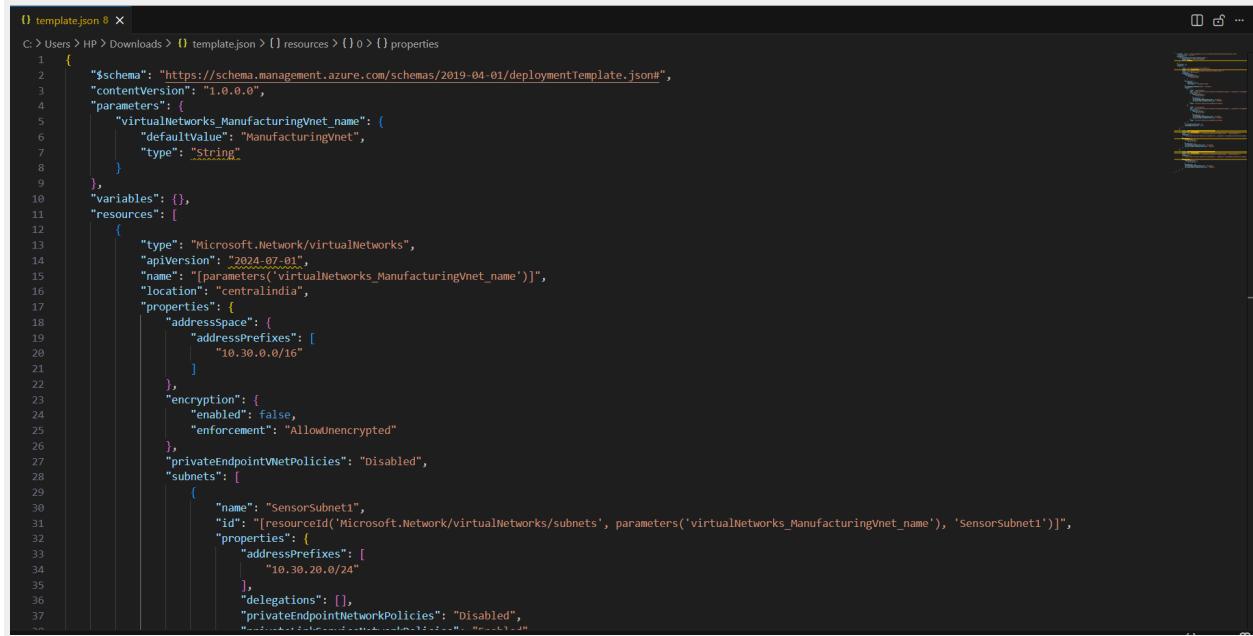
The screenshot shows the Azure portal interface for the 'CoreServicesVnet' resource. The left sidebar is open, showing navigation options like Home, CoreServicesVnet, Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Settings, Monitoring, Automation, CLI / PS, Tasks, and Export template (which is highlighted). The main content area displays the 'Export template' page for the 'CoreServicesVnet' virtual network. It includes a search bar, download and copy content buttons, and links for generating Terraform or Bicep configurations. The ARM Template tab is selected, showing the JSON template code. The template defines a virtual network named 'CoreServicesVnet' with two subnets: 'DatabaseSubnet' and 'SharedServicesSubnet'. The JSON code is as follows:

```
1  "$$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
2  "contentVersion": "1.0.0.0",
3  "parameters": {
4      "virtualNetworks_CoreServicesVnet_name": {
5          "defaultValue": "CoreServicesVnet",
6          "type": "String"
7      }
8  },
9  "variables": {},
10 "resources": [
11     {
12         "type": "Microsoft.Network/virtualNetworks",
13         "name": "[parameters('virtualNetworks_CoreServicesVnet_name')]"
```

```
C: > Users > HP > Downloads > template.json > ...
1  {
2      "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3      "contentVersion": "1.0.0.0",
4      "parameters": {
5          "virtualNetworks_CoreServicesVnet_name": {
6              "defaultValue": "CoreServicesVnet",
7              "type": "String"
8          }
9      },
10     "variables": {},
11     "resources": [
12         {
13             "type": "Microsoft.Network/virtualNetworks",
14             "apiVersion": "2024-07-01",
15             "name": "[parameters('virtualNetworks_CoreServicesVnet_name')]",
16             "location": "centralindia",
17             "properties": {
18                 "addressSpace": {
19                     "addressPrefixes": [
20                         "10.20.0.0/16"
21                     ]
22                 },
23                 "encryption": {
24                     "enabled": false,
25                     "enforcement": "AllowUnencrypted"
26                 },
27                 "privateEndpointVNetPolicies": "Disabled",
28                 "subnets": [
29                     {
30                         "name": "Subnet1"
31                     }
32                 ]
33             }
34         }
35     ]
36 }
37 }
```

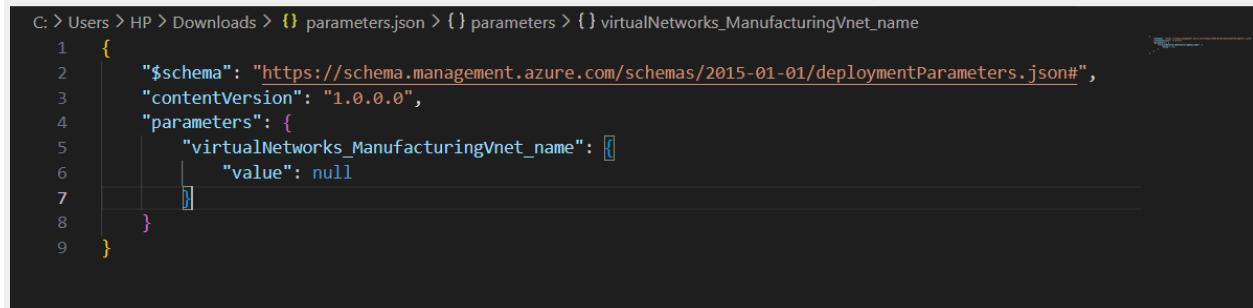
## Task 2: Create a virtual network and subnets using a template

- Locate the **template.json** file exported in the previous task.
- Edit the file. Be sure to **save** your changes.



```
C:\> Users > HP > Downloads > template.json > resources > 0 > properties
1 {
2     "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3     "contentVersion": "1.0.0.0",
4     "parameters": {
5         "virtualNetworks_ManufacturingVnet_name": {
6             "defaultValue": "ManufacturingVnet",
7             "type": "String"
8         }
9     },
10    "variables": {},
11    "resources": [
12        {
13            "type": "Microsoft.Network/virtualNetworks",
14            "apiVersion": "2024-07-01",
15            "name": "[parameters('virtualNetworks_ManufacturingVnet_name')]",
16            "location": "centralindia",
17            "properties": {
18                "addressSpace": {
19                    "addressPrefixes": [
20                        "10.30.0.0/16"
21                    ]
22                },
23                "encryption": {
24                    "enabled": false,
25                    "enforcement": "AllowUnencrypted"
26                },
27                "privateEndpointNetPolicies": "disabled",
28                "subnets": [
29                    {
30                        "name": "SensorSubnet1",
31                        "id": "[resourceId('Microsoft.Network/virtualNetworks/subnets', parameters('virtualNetworks_ManufacturingVnet_name'), 'SensorSubnet1')]",
32                        "properties": {
33                            "addressPrefixes": [
34                                "10.30.20.0/24"
35                            ],
36                            "delegations": [],
37                            "privateEndpointNetworkPolicies": "Disabled",
38                            "routeFilter": null
39                        }
40                    }
41                ]
42            }
43        }
44    ]
45}
```

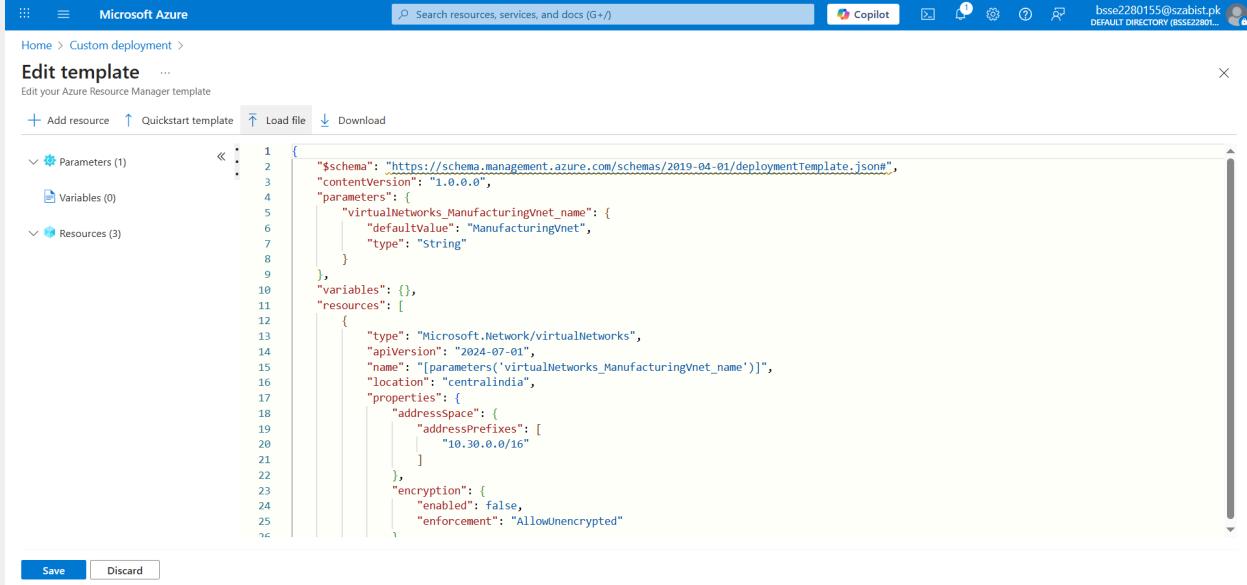
- Make changes to the **parameters** file.



```
C:\> Users > HP > Downloads > parameters.json > parameters > virtualNetworks_ManufacturingVnet_name
1 {
2     "$schema": "https://schema.management.azure.com/schemas/2015-01-01/deploymentParameters.json#",
3     "contentVersion": "1.0.0.0",
4     "parameters": {
5         "virtualNetworks_ManufacturingVnet_name": [
6             {
7                 "value": null
8             }
9         ]
10    }
11}
```

- **Save** your changes.

- In the portal, search for and select **Deploy a custom template**.
- Select **Build your own template in the editor** and then **Load file**.
- Select the **template.json** file with your Manufacturing changes, then select **save**.

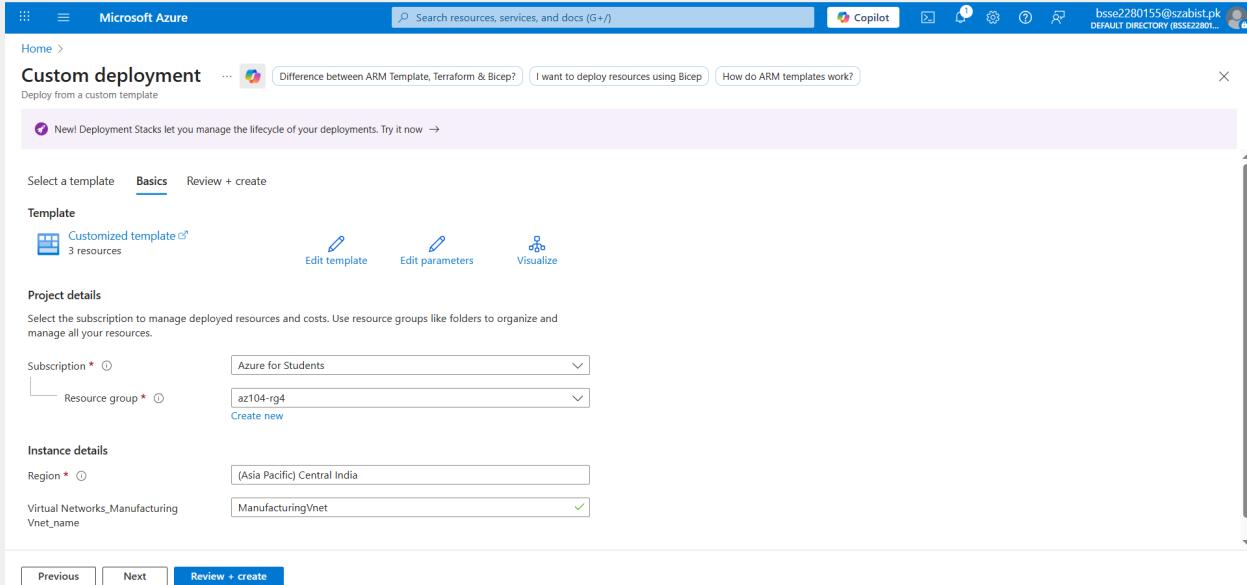


```

1  {
2    "$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
3    "contentVersion": "1.0.0.0",
4    "parameters": {
5      "virtualNetworks_ManufacturingVnet_name": {
6        "defaultValue": "ManufacturingVnet",
7        "type": "String"
8      }
9    },
10   "variables": {},
11   "resources": [
12     {
13       "type": "Microsoft.Network/virtualNetworks",
14       "apiVersion": "2024-07-01",
15       "name": "[parameters('virtualNetworks_ManufacturingVnet_name')]",
16       "location": "centralindia",
17       "properties": {
18         "addressSpace": {
19           "addressPrefixes": [
20             "10.30.0.0/16"
21           ]
22         },
23         "encryption": {
24           "enabled": false,
25           "enforcement": "AllowUnencrypted"
26         }
27       }
28     }
29   ]
30 }
31 
```

**Save** **Discard**

- Select **Edit parameters**, and then **Load file**.
- Select the **parameters.json** file with your Manufacturing changes, then select **save**.



New! Deployment Stacks let you manage the lifecycle of your deployments. Try it now →

Select a template **Basics** Review + create

**Template**

Customized template 3 resources View details Preview Visualize

**Project details**

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* Optional Change Azure for Students

Resource group \* Optional Change az104-rg4 Create new

**Instance details**

Region \* Optional Change (Asia Pacific) Central India

Virtual Networks\_ManufacturingVnet\_name Optional ManufacturingVnet

**Review + create**

- Select **Review + create** and then **Create**.

The screenshot shows the Microsoft Azure Deployment Overview page. At the top, it displays the deployment name: "Microsoft.Template-20260106151543 | Overview". Below this, a green checkmark icon indicates that the deployment is complete. The deployment details are listed: Deployment name: Microsoft.Template-20260106151543, Subscription: Azure for Students, Resource group: az104-rg4. The start time is 1/6/2026, 3:15:48 PM, and the Correlation ID is e11c4229-8a4c-431c-92c3-384a96096e12. On the right side, there are several promotional cards: "Deployment succeeded" (with a green checkmark), "Cost management" (with a dollar sign icon), "Microsoft Defender for Cloud" (with a shield icon), "Free Microsoft tutorials" (with a person icon), "Work with an expert" (with a person icon), and "Find an Azure expert" (with a person icon).

## Task 3: Create and configure communication between an Application Security Group and a Network Security Group

- In the Azure portal, search for and select **Application security groups**.
- Click **Create**.

The screenshot shows the "Create an application security group" wizard in the Microsoft Azure portal. The first step, "Basics", is selected. Under "Project details", the subscription is set to "Azure for Students" and the resource group is "az104-rg4". Under "Instance details", the name is "asg-web" and the region is "Central India". At the bottom, there are buttons for "Review + create", "< Previous", "Next : Tags >", and "Download a template for automation".

- Click **Review + create** and then after the validation click **Create**.

The screenshot shows the Microsoft Azure portal's deployment overview page. A deployment named 'CreateApplicationSecurityGroupBladeViewModel' has been completed successfully. The deployment details include:

- Deployment name: CreateApplicationSecurityGroupBladeViewModel
- Subscription: Azure for Students
- Resource group: az104-rg4
- Start time: 1/6/2026, 3:21:33 PM
- Correlation ID: 9a6149ec-bfda-4136-b045-539270efb407

On the right side of the portal, there are several promotional cards:

- Deployment succeeded**: A green checkmark icon.
- Cost management**: An icon of a dollar sign.
- Microsoft Defender for Cloud**: An icon of a shield with a lock.
- Free Microsoft tutorials**: An icon of a person learning.

- In the Azure portal, search for and select **Network security groups**.
- Select **Create**.

The screenshot shows the 'Create network security group' wizard in the Microsoft Azure portal. The 'Review + create' step is currently selected. The 'Basics' section displays the following configuration:

Setting	Value
Subscription	Azure for Students
Resource group	az104-rg4
Region	Central India
name	myNSGSecure

The 'Tags' section shows 'None'.

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

A deployment progress bar on the right indicates 'Initializing deployment...'.

- Under **Settings** click **Subnets** and then **Associate**.

**Associate subnet**

myNSGSecure

Virtual network: CoreServicesVnet (az104-rg4)

Subnet \*: SharedServicesSubnet

OK

- Configure an inbound security rule to allow ASG traffic

Priority	Name	Port	Protocol	Source	Destination	Action
100	AllowASG	80443	TCP	ASG-WEB	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerIn...	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

- Configure an outbound NSG rule that denies Internet access

Priority	Name	Port	Protocol	Source	Destination	Action
4096	DenyInternetOutbound	Any	Any	Any	Internet	Deny
65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowInternetOutBound	Any	Any	Any	Internet	Allow
65500	DenyAllOutBound	Any	Any	Any	Any	Deny

## Task 4: Configure public and private Azure DNS zones

- Configure a public DNS zone.

Validation passed

Basics DNS Zone Editor Tags Review + Create

View automation template

**Basics**

Subscription	Azure for Students
Resource group	az104-rg4
Resource group location	Central India
Name	szabist.com

**DNS Zone Record Set(s)**

Number of record sets	0 record set(s)
-----------------------	-----------------

Create < Previous Next > Give feedback

- On the Overview blade notice the names of the four Azure DNS name servers assigned to the zone.

szabist.com Overview

Search

Child zone Record sets DNSSEC Import Export Move Refresh Delete Give feedback

**Overview**

Activity log Access control (IAM) Tags Diagnose and solve problems Resource visualizer Settings DNS Management Monitoring Automation Help

Get Started Tutorials Tools + SDK

Resource group (move) : az104-rg4 Max number of record s... : 10000  
Location : Global Name server 1 : ns1-08.azure-dns.com.  
Subscription (move) : Azure for Students Name server 2 : ns2-08.azure-dns.net.  
Subscription ID : db878fcc-8781-42d0-a61d-55de3d976446 Name server 3 : ns3-08.azure-dns.org.  
Recordsets : 2 Name server 4 : ns4-08.azure-dns.info.

Add DNS record sets Import record sets from file Access control Azure DNS Documentation

Add or remove favorites by pressing Ctrl+Shift+F

- Expand the DNS Management blade and select **Recordsets**. Click **Add**.

The screenshot shows the Microsoft Azure portal interface. On the left, the navigation menu includes 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', 'Resource visualizer', 'Settings', 'DNS Management', and 'Recordsets'. The 'Recordsets' item is selected. The main content area displays a table of existing record sets:

Name	Type	TTL	Value
@	NS	172800	ns1-08.azure-dns.com. ns2-08.azure-dns.net. ns3-08.azure-dns.org. ns4-08.azure-dns.info.
@	SOA	3600	Email: azuredns-hostmaster.microsoft.com Host: ns1-08.azure-dns.com. Refresh: 3600 Retry: 300 Expire: 2419200 Minimum TTL: 300 Serial number: 1

A search bar at the top right says 'Fetched 2 record set(s.)'. A modal window titled 'Add record set' is open on the right, with the following details:

- Name:** www
- Type:** A - IPv4 Address records
- Alias record set:** No
- TTL:** 1
- TTL unit:** Hours
- IP address:** 10.1.1.4
- Value:** 0.0.0.0

At the bottom of the modal are 'Add', 'Cancel', and 'Give feedback' buttons.

- Verify the host name **www.szabist.com** resolves to the IP address you provided.

```

Command Prompt
Microsoft Windows [Version 10.0.19045.6466]
(c) Microsoft Corporation. All rights reserved.

C:\Users\HP>nslookup www.szabist.com
Server: UnKnown
Address: fe80::1

Non-authoritative answer:
Name: www.szabist.com
Addresses: 76.223.54.146
          13.248.169.48

C:\Users\HP>nslookup www.szabist.com ns1-08.azure-dns.com.
0.0.0.0.1.6.0.1.3.0.6.2.ip6.arpa      nameserver = ns4-04.azure-dns.info
0.0.0.0.1.6.0.1.3.0.6.2.ip6.arpa      nameserver = ns3-04.azure-dns.org
0.0.0.0.1.6.0.1.3.0.6.2.ip6.arpa      nameserver = ns2-04.azure-dns.net
0.0.0.0.1.6.0.1.3.0.6.2.ip6.arpa      nameserver = ns1-04.azure-dns.com
Server: UnKnown
Address: 2603:1061:0:700::8

Name: www.szabist.com
Address: 10.1.1.4

```

- Configure a private DNS zone.

Validation passed

[View automation template](#)

**Basics**

Subscription	Azure for Students
Resource group	az104-rg4
Resource group location	Central India
Name	private.szabist.com

**DNS Zone Record Set(s)**

Number of record sets	0 record set(s)
-----------------------	-----------------

**Virtual network link(s)**

Numer of Virtual Network Links	0 virtual network link(s)
--------------------------------	---------------------------

[Create](#) [< Previous](#) [Next >](#) [Give feedback](#)

- Expand the **DNS Management** blade and then select **Virtual network links**.

Link name \*  
manufacturing-link

**Virtual network details**

Only virtual networks with Resource Manager deployment model are supported for linking with Private DNS zones. Virtual networks with Classic deployment model are not supported.

I know the resource ID of virtual network [\(i\)](#)

**Subscription \***  
Azure for Students

**Virtual Network \***  
ManufacturingVnet (az104-rg4)

**Configuration**

Enable auto registration [\(i\)](#)  
 Enable fallback to internet [\(i\)](#)

[Create](#) [Cancel](#) [Give feedback](#)

- From the DNS Management blade select **Recordsets**.

The screenshot shows the Microsoft Azure portal interface. The left sidebar has a tree view with 'private.szabist.com' selected. Under 'private.szabist.com', 'Records' is highlighted. The main content area shows a table of record sets:

Name	Type	TTL
@	SOA	3600

A modal dialog titled 'Add record set' is open on the right. It has the following fields:

- Name:** sensorvm
- Type:** A - IPv4 Address records
- TTL:** 1
- TTL unit:** Hours
- IP address:** 10.1.1.4
- Subnet:** 0.0.0.0

At the bottom of the dialog are 'Add', 'Cancel', and 'Give feedback' buttons.