

MS NLB

Špecializované IKT systémy Windows

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NLB cluster

Definícia

Poskytuje distribúciu prichádzajúceho sieťového prenosu medzi jednotlivé nody klástra a zároveň vysokú dostupnosť „stateless“ aplikácií

Vysoká dostupnosť (UPTIME)

% dostupnosť	DT za rok	DT za mesiac	DT za týždeň
90	36,5 dňa	72 hodín	16,8 hodín
99	3,65 dní	7,2 hodiny	1,68 hodín
99,9	8,76 dní	43,2 minút	10,1 minút
99,99	52,6 minút	4,32 minút	1,01 minúty
99,999	5,26 minúty	25,9 sekúnd	6,05 sekúnd
99,9999	5,26 minút	25,9 sekúnd	6,05 sekúnd

NLB cluster

NLB obsahuje funkcionality pre:

- Rozpoznanie node failure
- Balance sieťový prenos medzi nodmi (i v prípade node add/removal)
- Obnovenie a rozdistribuovanie workload-u v rámci 10 sec pri failure
- Pridanie (online) a odobratie Nodu (online) v závislosti na záťaži

Prakticko použitie

- Web based aplikácie
 - Web servre
 - VPNs
 - RDS
 - Netscaler

NLB cluster

Requirements

- Windows server 201x
- Cluster name a cluster IP
- Všetky nodes musia byť na rovnakej sieti
- Žiadne obmedzenie na počet NIC
- Jednotlivé Nodes môžu mať rozdielny počet NIC
- Všetky Nodes musia mať NIC nastavené na unicast alebo multicast (nie mix)
 - Pri unicast NIC musia podporovať zmenu MAC
- Iba TCP/IP musia byť povolené na NIC (žiadne ďalšie ako napr IPX)
- IP adresa Nodov musí byť STATICKÁ

NLB cluster

Konfigurácia

- NLB je nainštalovaný ako súčasť windows server sieťového ovládača
- Aplikácia je nainštalovaná na každom node
- Je možné distribuovať prenos na jeden Node (default), alebo balancovať cez všetky
- Max 32 Nodov
- Môžeme konfigurovať vCLU na každom Node per NIC alebo viacero vCLU na jednom NIC
- Žiaden špeciálny hw
- Žiaden špeciálna sw konfigurácia
- Je možné konfigurovať host pre pridanie do CLU v prípade výpadku

NLB cluster

Nody môžu bežať s rôznou edíciou OS

Latencia medzi Nodmi nesmie prekročiť 250ms

Best practices

- Nody používajú veľmi podobný HW
- Nody majú rovnakú verziu OS

Inštalácia

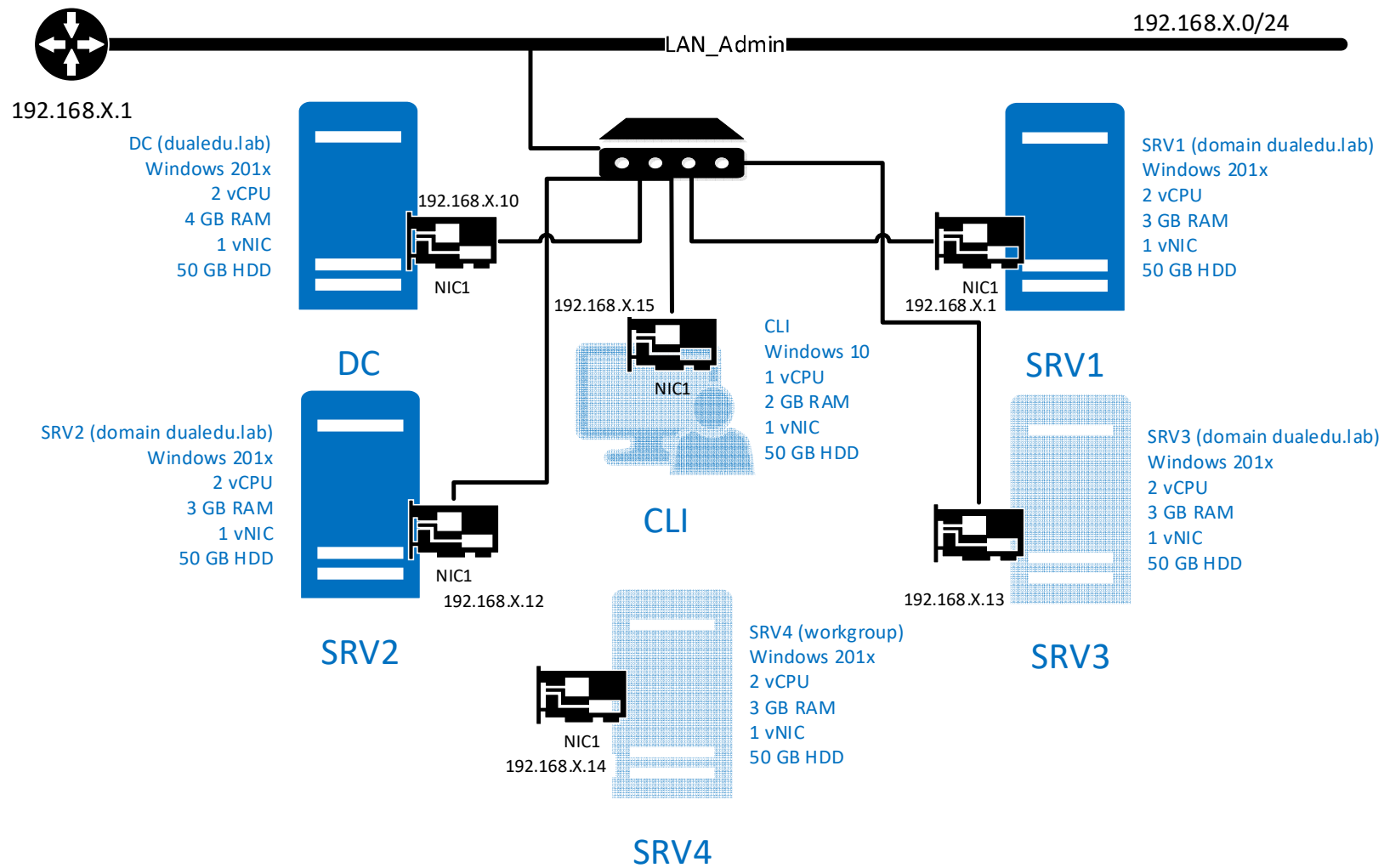
Requirements

- Cluster IP a DNS meno
- Plne nainštalované a customizované servre
- Pridanie A records nlb-cluster.dual.edu do DNS

Postup

1. Inštalácia Web server role
2. Nainštalovanie NLB Cluster feature na každý node
3. Vytvorenie NLB cluster (Node by Node)
4. Test Web access z DC

LAB setup



Inštalácia NLB

::1. Inštalácia NLB role na SRV1/SRV2

Administrator: Windows PowerShell

```
PS C:\Users\Administrator>
PS C:\Users\Administrator> Install-WindowsFeature -Name NLB -IncludeAllSubFeature -IncludeManagementTools
```

Success	Restart Needed	Exit Code	Feature Result
True	No	Success	{Network Load Balancing, Remote Server Adm...

Add Roles and Features Wizard

Select features

Before You Begin
Installation Type
Server Selection
Server Roles
Features
Confirmation
Results

Select one or more features to install

Features

- ☐ MultiPoint Connector
- ☒ Network Load Balancing
- ☐ Network Virtualization
- ☐ Peer Name Resolution Protection
- ☐ Quality Windows Audio Video Streaming
- ☐ RAS Connection Manager
- ☐ Remote Assistance
- ☐ Remote Differential Compression
- ☐ Remote Server Administration Tools
- ☐ RPC over HTTP Proxy
- ☐ Setup and Boot Event Communication
- ☐ Simple TCP/IP Services
- ☐ SMB 1.0/CIFS File Sharing
- ☐ SMB Bandwidth Limit
- ☐ SMTP Server
- ☐ SNMP Service
- ☐ Storage Replica
- ☐ Telnet Client
- ☐ TFTP Client

DESTINATION SERVER
srv1.dual.edu

Add Roles and Features Wizard

Add features that are required for Network Load Balancing?

The following tools are required to manage this feature, but do not have to be installed on the same server.

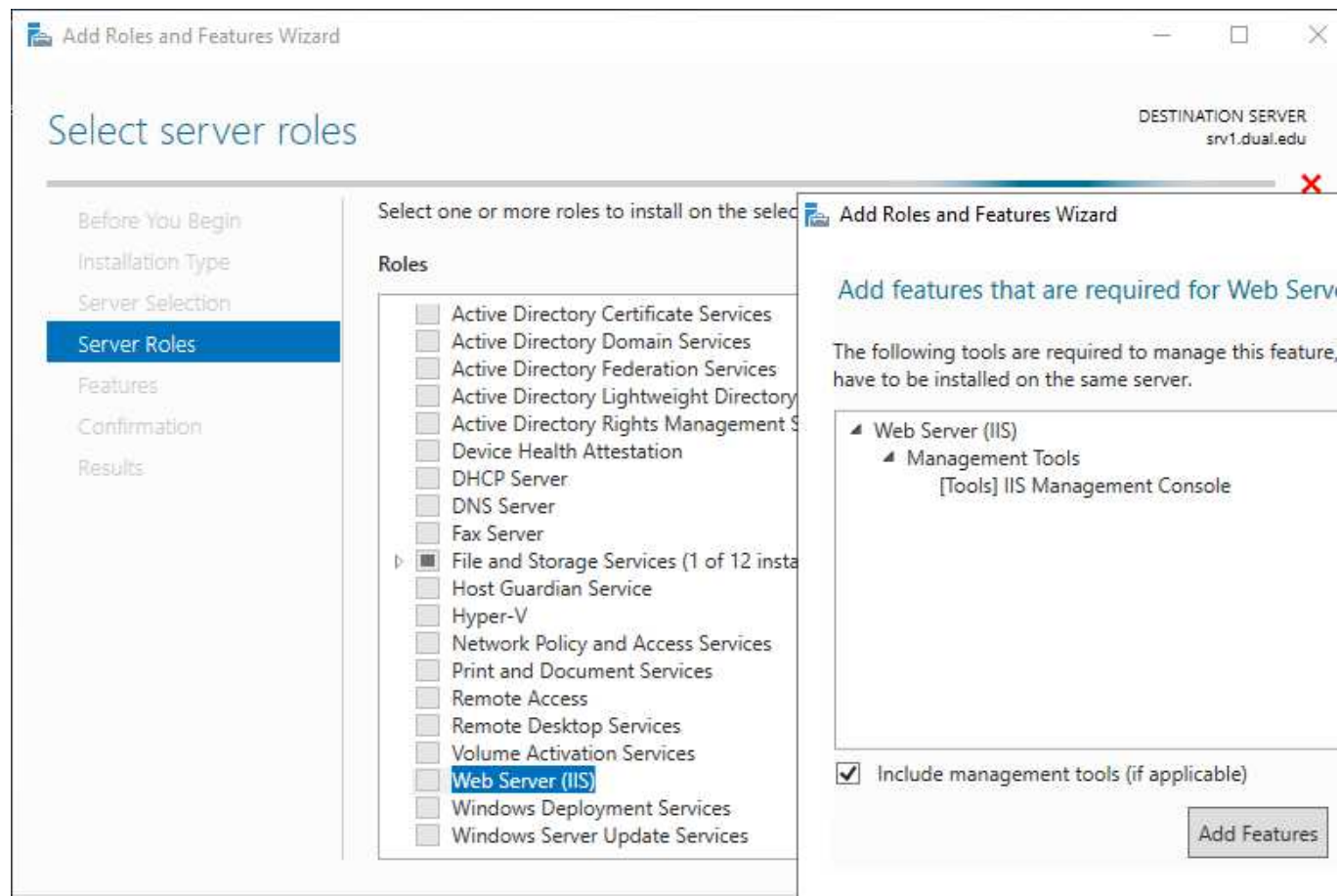
- Remote Server Administration Tools
 - Feature Administration Tools
 - [Tools] Network Load Balancing Tools

☒ Include management tools (if applicable)

Add Features Cancel

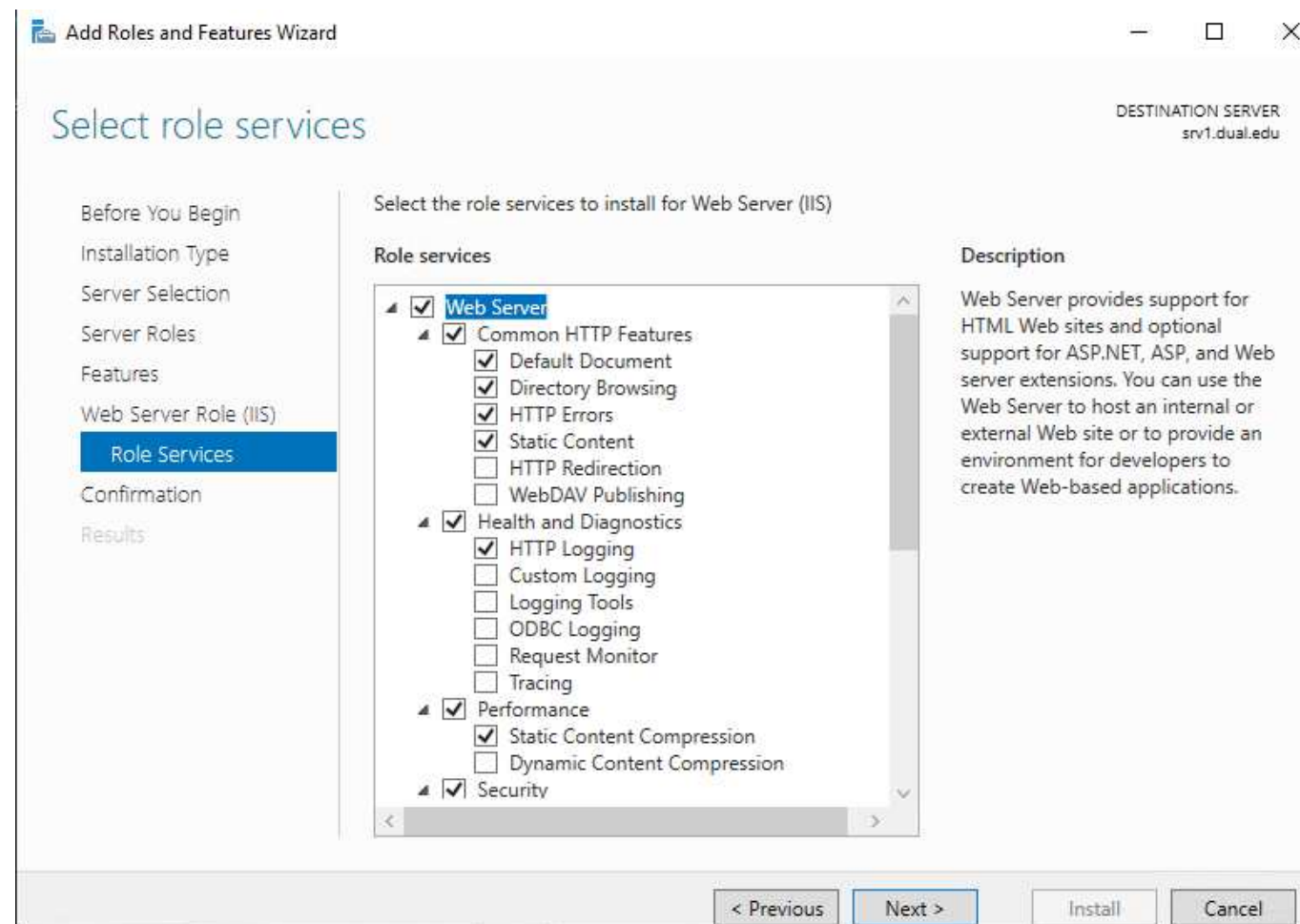
Inštalácia NLB

::2. Inštalácia Web role na oboch SRV1/SRV2



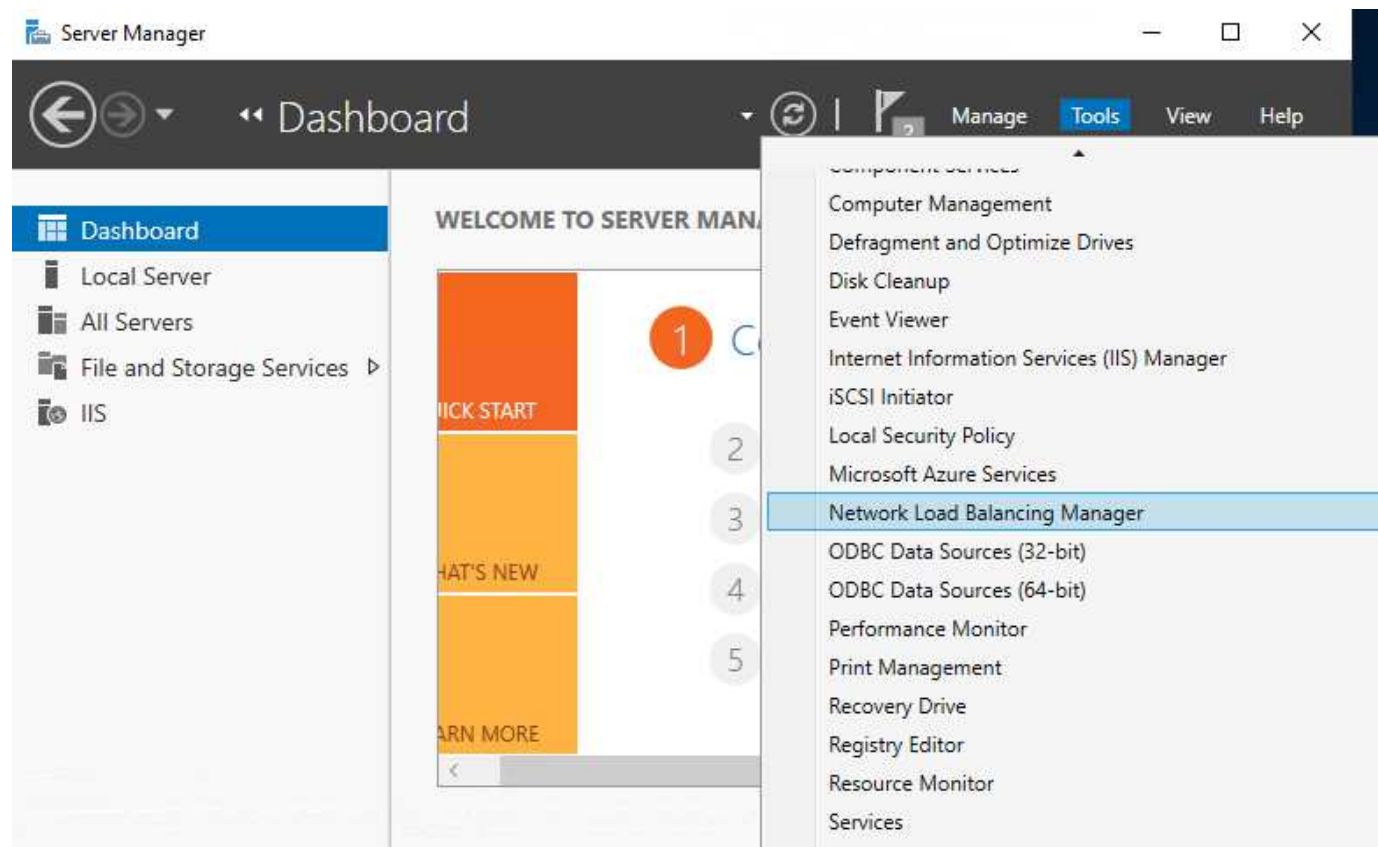
Inštalácia NLB

::2. Ponechanie default komponentov Web role



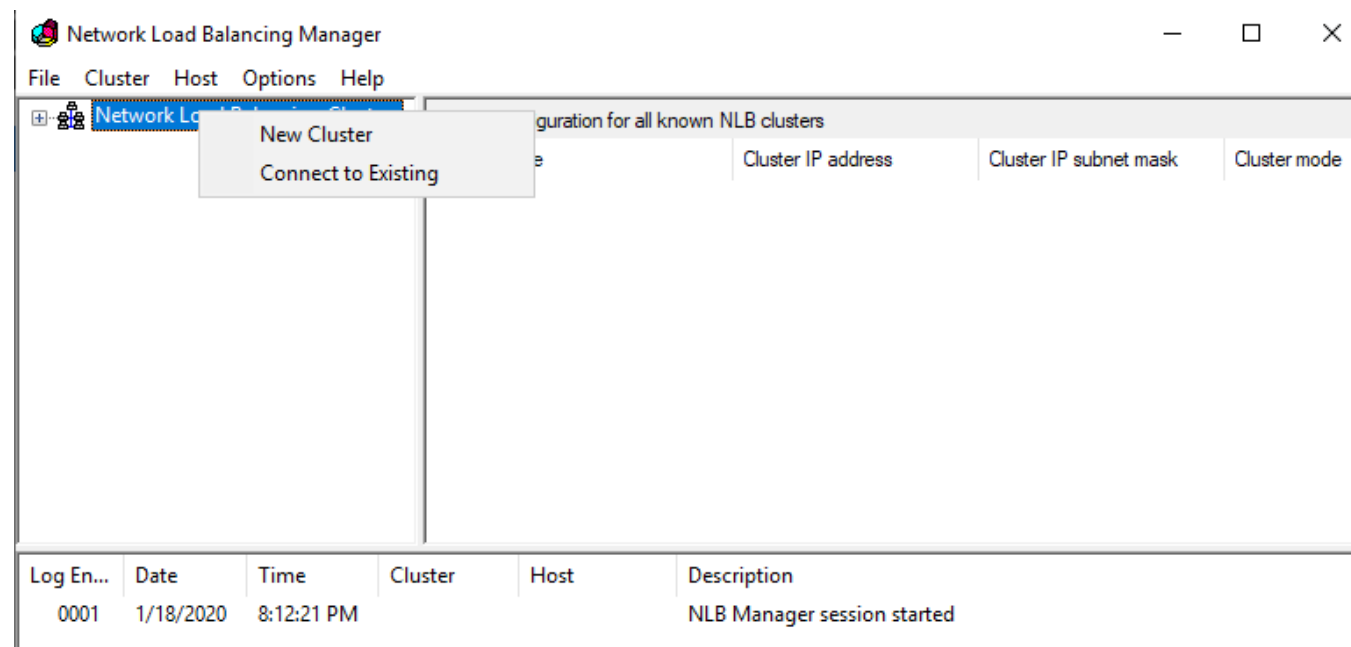
Inštalácia NLB

::3. Spustenie NLB konzole



Inštalácia NLB

::4. Spustenie NLB konzole a New Cluster wizard



Inštalácia NLB

::4. Spustenie NLB konzole a New Cluster wizard

Two side-by-side screenshots of the "New Cluster: Connect" wizard window.

Left Screenshot:

- Title: New Cluster: Connect
- Instruction: Connect to one host that is to be part of the new cluster and select the cluster interface
- Host:
- Connection status:
- Interfaces available for configuring a new cluster:

Interface name	Interface IP
----------------	--------------
- Buttons: < Back, Next >, Cancel, Help

Right Screenshot:

- Title: New Cluster: Connect
- Instruction: Connect to one host that is to be part of the new cluster and select the cluster interface
- Host:
- Connection status:

Connected
- Interfaces available for configuring a new cluster:

Interface name	Interface IP
Ethemet	192.168.2.11
- Buttons: < Back, , Cancel, Help

Inštalácia NLB

::4. Spustenie NLB konzole a New Cluster wizard

New Cluster : Host Parameters

Priority (unique host identifier): 1

Dedicated IP addresses

IP address	Subnet mask
192.168.2.11	255.255.255.0

Add... Edit... Remove

Initial host state

Default state: Started

☐ Retain suspended state after computer restarts

< Back Next > Cancel Help

New Cluster : Cluster IP Addresses

The cluster IP addresses are shared by every member of the cluster for load balancing. The first IP address listed is considered the primary cluster IP address and used for cluster heartbeats.

Cluster IP addresses

Add IP Address

☒ Add IPv4 address:

IPv4 address: 192 . 168 . 2 . 40

Subnet mask: 255 . 255 . 255 . 0

☐ Add IPv6 address:

IPv6 address:

☐ Generate IPv6 addresses:

☐ Link-local ☐ Site-local ☐ Global

OK Cancel

< Back Next > Cancel Help

Inštalácia NLB

::4. Spustenie NLB konzole a New Cluster wizard

New Cluster : Cluster Parameters

Cluster IP configuration

IP address: 192.168.2.40

Subnet mask: 255 . 255 . 255 . 0

Full Internet name: nlb-clu.dual.edu

Network address: 02-bf-c0-a8-02-28

Cluster operation mode

☒ Unicast

☐ Multicast

☐ IGMP multicast

< Back Next > Cancel Help

New Cluster : Port Rules

Defined port rules:

Cluster IP ...	Start	End	Prot...	Mode	Priority	Load	Affinity	Time
All	0	65535	Both	Multiple	--	--	Single	N/A

Add... Edit... Remove

Port rule description

TCP and UDP traffic directed to any cluster IP address that arrives on ports 0 through 65535 is balanced across multiple members of the cluster according to the load weight of each member. Client IP addresses are used to assign client connections to a specific cluster host.

< Back Finish Cancel Help

NLB operation mode	Special requirements	Advantages	Disadvantages
Unicast	NLB must be able to change the MAC adapter address	<p>Easy to configure</p> <p>Appropriate for simple environments</p>	<p>May flood other systems with network traffic, causing performance issues (you may have to use additional hardware to resolve those issues)</p> <p>Not appropriate for more complex environments</p>
Multicast	The network infrastructure must use a static ARP entry and a static MAC address table entry.	<p>More efficient use of bandwidth and lower risk of performance impacts than unicast mode</p> <p>Each adapter uses its built-in MAC address</p>	More complex to configure than unicast
Multicast with IGMP	The network switches must be capable of IGMP snooping	<p>Same advantages as multicast</p> <p>Additional advantage of automatic configuration</p>	Requires that the network hardware have specific capabilities that the other modes do not need

Validácia konfigurácie #1

The screenshot displays the Network Load Balancing Manager application window. The title bar reads "Network Load Balancing Manager" with standard window controls. The menu bar includes "File", "Cluster", "Host", "Options", and "Help".

The left pane shows a tree view of "Network Load Balancing Clusters" containing a sub-entry "nlb-clu.dual.edu (192.168.2.40)" which has a child "SRV1(Ethernet)".

The right pane, titled "Cluster configuration for all known NLB clusters", contains a table with the following data:

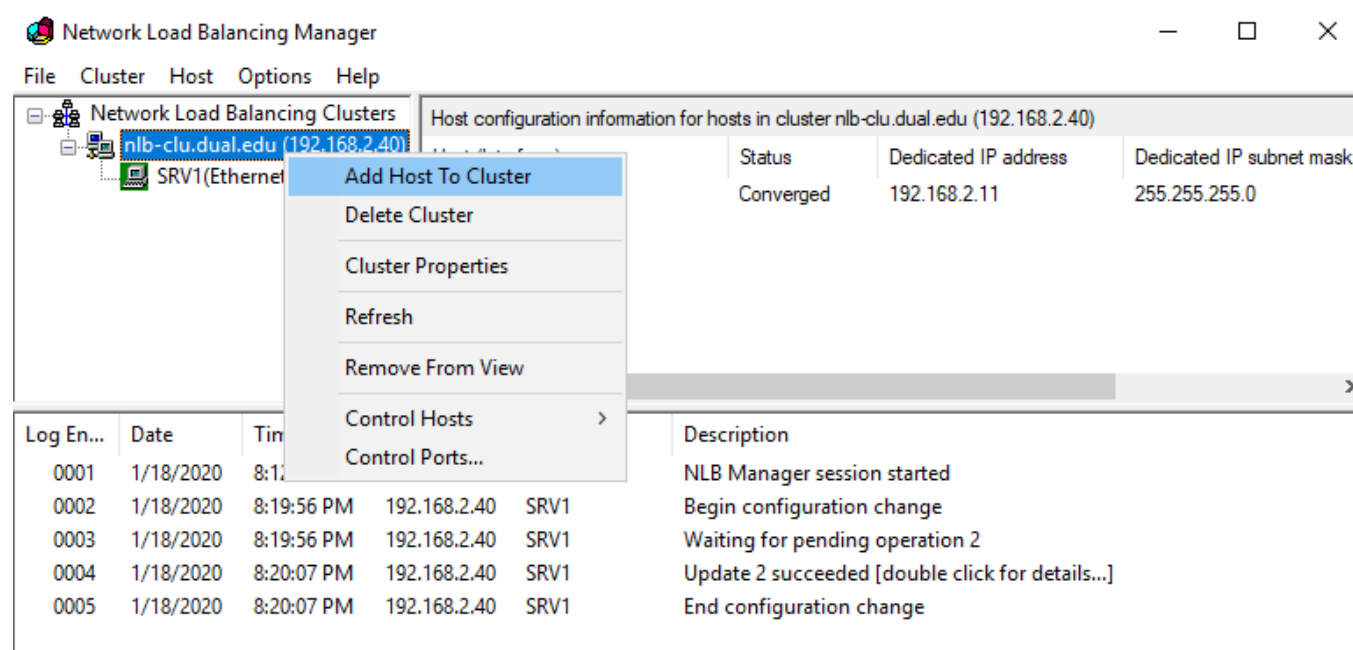
Cluster name	Cluster IP address	Cluster IP subnet mask	Cluster mode
nlb-clu.dual.edu	192.168.2.40	255.255.255.0	unicast

Below the configuration pane is a log table with the following data:

Log En...	Date	Time	Cluster	Host	Description
0001	1/18/2020	8:12:21 PM			NLB Manager session started
0002	1/18/2020	8:19:56 PM	192.168.2.40	SRV1	Begin configuration change
0003	1/18/2020	8:19:56 PM	192.168.2.40	SRV1	Waiting for pending operation 2
0004	1/18/2020	8:20:07 PM	192.168.2.40	SRV1	Update 2 succeeded [double click for details...]
0005	1/18/2020	8:20:07 PM	192.168.2.40	SRV1	End configuration change

Inštalácia NLB

::5. Pripojenie druhého Nodu do cluster-a



Inštalácia NLB

::5. Pripojenie druhého Nodu do cluster-a

The screenshot displays the 'Add Host to Cluster' wizard with three tabs: 'Connect', 'Host Parameters', and 'Port Rules'.

Add Host to Cluster : Connect

Connect to the host that is to be added to the existing cluster

Host:

Connection status
Connected

Interfaces available for configuring the cluster

Interface name	Interface IP
Ethernet	192.168.2.12

Add Host to Cluster : Host Parameters

Priority (unique host identifier):

Dedicated IP addresses

IP address
192.168.2.12

Initial host state
Default state:

☐ Retain suspended state after computer re

Add Host to Cluster : Port Rules

Defined port rules:

Cluster IP address	Start	End	Prot...	Mode	Priority	Load	Affinity
All	0	65535	Both	Multiple	-	Equal	Single

Port rule description
TCP and UDP traffic directed to any cluster IP address that arrives on ports 0 through 65535 is balanced equally across all members of the cluster. Client IP addresses are used to assign client connections to a specific cluster host.

Navigation buttons: < Back, Next >, Cancel (under Connect); < Back, Finish, Cancel, Help (under Port Rules).

Validácia konfigurácie #2

The screenshot displays the Network Load Balancing Manager interface. The left pane shows a tree view of 'Network Load Balancing Clusters' with 'nlb-cluster.dual.edu (192.168.2.40)' selected, containing two hosts: 'SRV1(Ethernet)' and 'SRV2(Ethernet)'. The right pane shows 'Host configuration information for hosts in cluster nlb-cluster.dual.edu (192.168.2.40)' with a table of host details.

Host (Interface)	Status	Dedicated IP address
SRV1(Ethernet)	Converged	192.168.2.11
SRV2(Ethernet)	Converged	192.168.2.12

Below the right pane is a log table showing configuration changes:

Log En...	Date	Time	Cluster	Host	Description
0002	1/18/2020	8:59:01 PM	192.168.2.40	SRV1	Begin configuration change
0003	1/18/2020	8:59:01 PM	192.168.2.40	SRV1	Waiting for pending operation 2
0004	1/18/2020	8:59:12 PM	192.168.2.40	SRV1	Update 2 succeeded [double click for details...]
0005	1/18/2020	8:59:12 PM	192.168.2.40	SRV1	End configuration change
0006	1/18/2020	9:01:49 PM	192.168.2.40	SRV2	Begin configuration change

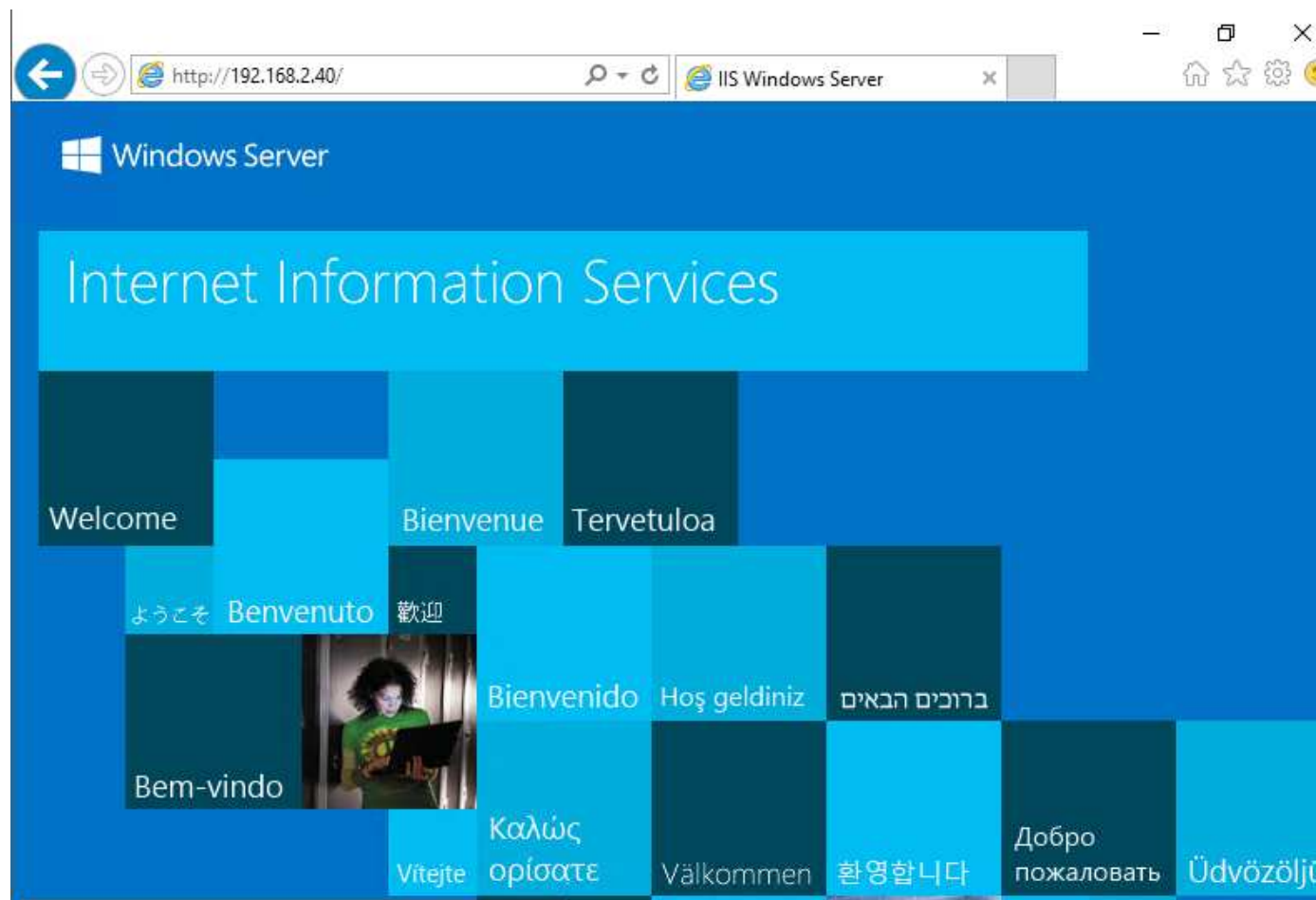
You can configure and manage Networking Load Balancing using the following cmdlets:

- **Add-NlbClusterNode**: Adds a new node to the NLB cluster.
- **Add-NlbClusterNodeDip**: Adds a dedicated IP address to an NLB cluster.
- **Add-NlbClusterPortRule**: Adds a new port rule to an NLB cluster.
- **Add-NlbClusterVip**: Adds a virtual IP address to an NLB cluster.
- **Disable-NlbClusterPortRule**: Disables a port rule on an NLB cluster or on a specific host in the cluster.
- **Enable-NlbClusterPortRule**: Enables a port rule on an NLB cluster or on a specific node in the cluster.
- **Get-NlbCluster**: Retrieves information about the NLB cluster object that is queried by the caller.
- **Get-NlbClusterDriverInfo**: Retrieves information about the NLB driver on the local machine.
- **Get-NlbClusterNode**: Retrieves information about the NLB cluster object that is queried by the caller.
- **Get-NlbClusterNodeDip**: Retrieves the dedicated IP address that is queried by the caller.
- **Get-NlbClusterNodeNetworkInterface**: Retrieves information about interfaces, including information about the NLB driver, on a host.
- **Get-NlbClusterPortRule**: Retrieves the port rule objects that are queried by the caller.
- **Get-NlbClusterVip**: Retrieves virtual IP addresses that are queried by the caller.
- **New-NlbCluster**: Creates an NLB cluster on the specified interface that is defined by the node and network adapter name.
- **New-NlbClusterIpv6Address**: Generates IPv6 addresses to create cluster virtual IP addresses or node dedicated IP addresses.
- **Remove-NlbCluster**: Deletes an NLB cluster.
- **Remove-NlbClusterNode**: Removes a node from the NLB cluster.

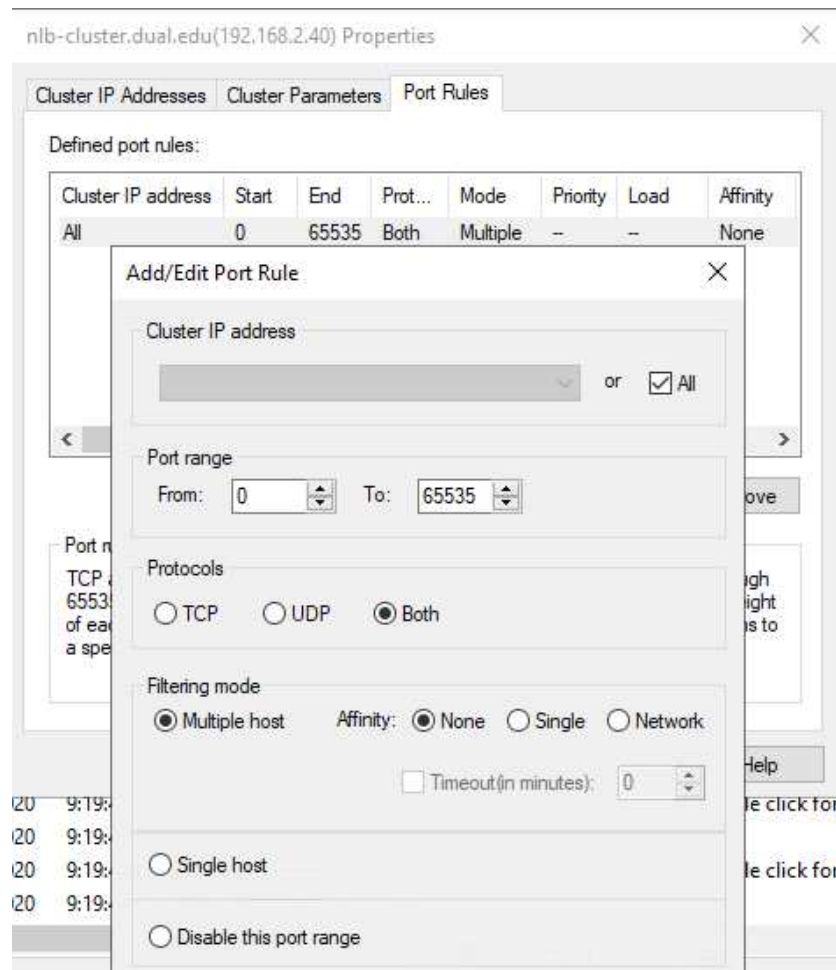
- **Remove-NlbClusterNodeDip**: Removes a dedicated IP address from an NLB cluster.
- **Remove-NlbClusterPortRule**: Removes a port rule from an NLB cluster.
- **Remove-NlbClusterVip**: Removes a virtual IP address from an NLB cluster.
- **Resume-NlbCluster**: Resumes all nodes in an NLB cluster.
- **Resume-NlbClusterNode**: Resumes the node in an NLB cluster that was suspended.
- **Set-NlbCluster**: Edits the configuration of an NLB cluster.
- **Set-NlbClusterNode**: Edits the NLB cluster node settings.
- **Set-NlbClusterNodeDip**: Edits the dedicated IP address of an NLB cluster.
- **Set-NlbClusterPortRule**: Edits the port rules for an NLB cluster.
- **Set-NlbClusterPortRuleNodeHandlingPriority**: Sets the host priority of a port rule for a specific NLB node.
- **Set-NlbClusterPortRuleNodeWeight**: Sets the load weight of a port rule for a specific NLB node.
- **Set-NlbClusterVip**: Edits the virtual IP address of an NLB cluster.
- **Start-NlbCluster**: Starts all nodes in an NLB cluster.
- **Start-NlbClusterNode**: Starts an NLB cluster node.
- **Stop-NlbCluster**: Stops all nodes of an NLB cluster.
- **Stop-NlbClusterNode**: Stops a node in an NLB cluster.
- **Suspend-NlbCluster**: Suspends all nodes of an NLB cluster.
- **Suspend-NlbClusterNode**: Suspends a specific node in an NLB cluster.

Validácia konfigurácie #3

:: Z DC otvor web <http://192.168.2.40>



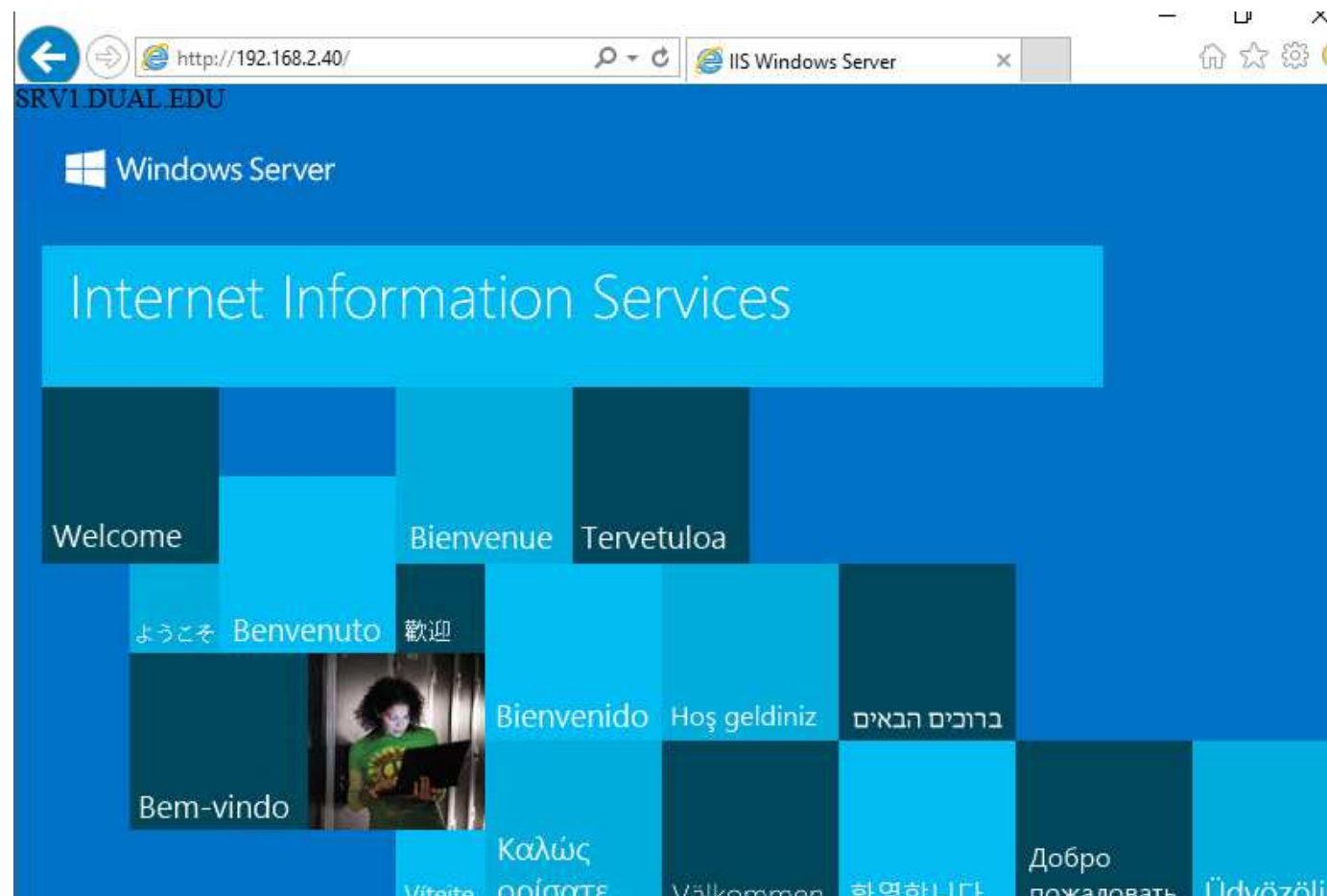
::Konfigurácia Filtering mode a Affinity



- **Multiple hosts:** Permits all cluster hosts to actively respond to client requests. NLB nodes respond according to the weight assigned to each node. Because this allows the customizing of the affinity and load balancing, it is the most common mode used. Multiple host filtering increases availability and scalability, because you can increase capacity by adding nodes, and the cluster continues to function in the event of node failure.
- **Single host:** Allows only one cluster host (the host with the highest priority) in the cluster to actively respond to client requests. If the host fails, the host with the next highest priority takes over for the failed host. It is usually used to configure one host as the primary server and other hosts as backup servers. Single host rules increase availability, but do not increase scalability.
- **Disable:** Prevents the cluster from responding to a specific type of client traffic.
- **None:** Any cluster node responds to any client request, even if the client is reconnecting after an interruption. This option is suitable for stateless application, where the server that is servicing the request does not have to remember the previous events to complete the request. As a result, the client can jump from one server to another within the cluster without problem.
- **Single:** A single cluster node handles all requests from a single client. This option is useful for stateful applications where the status of a process or transaction is maintained through the entire connection including when using SSL and e-commerce shopping cart applications.
- **Class C:** A single node responds to all requests from a class C network (a network with a subnet of 255.255.255.0), often found when used with multiple proxy servers. This type of server is often used with cookie-based affinity or when a common database or session state server is used.

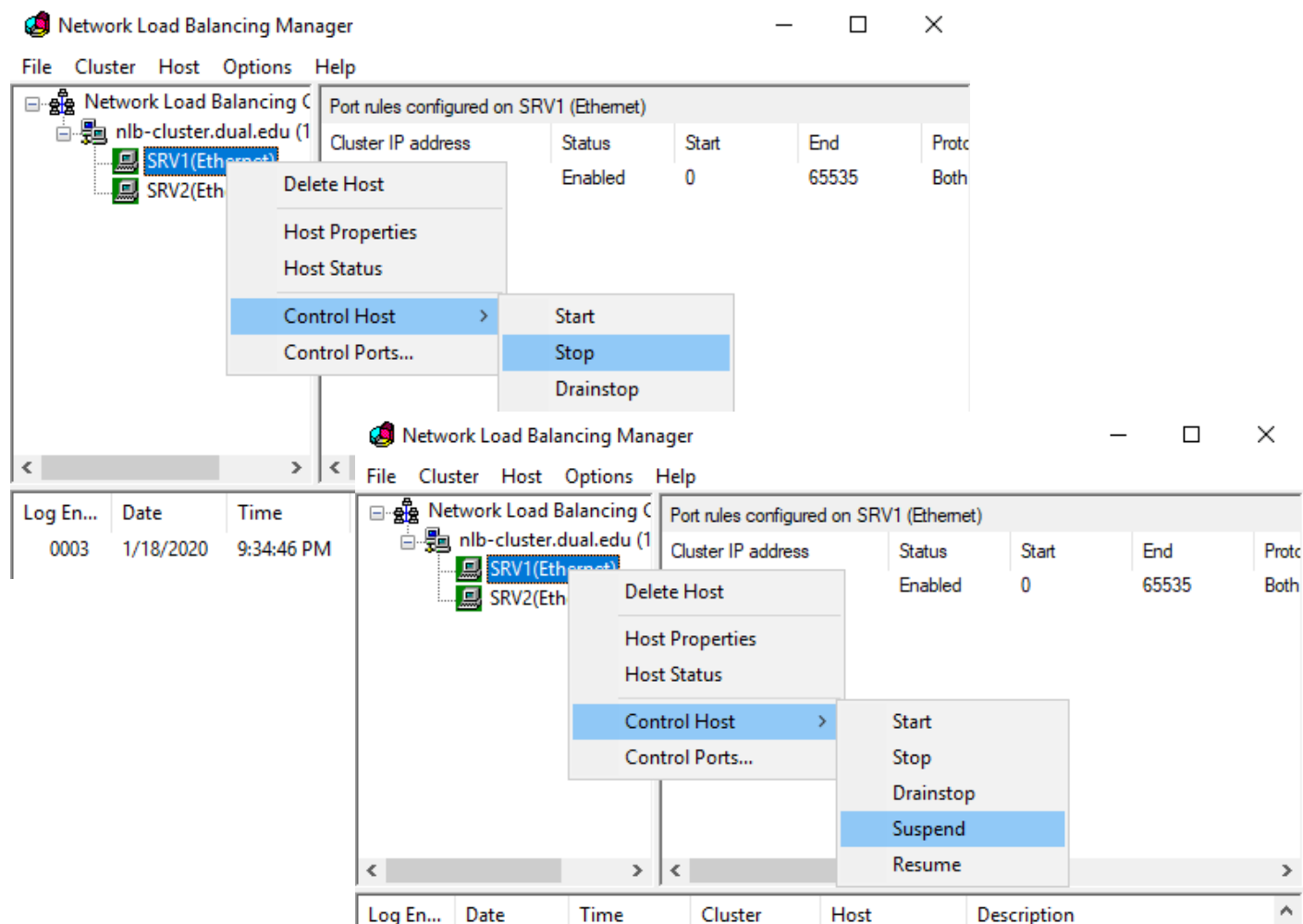
Failover / HA test

::1. Connect to IP <http://192.168.2.40> z DC



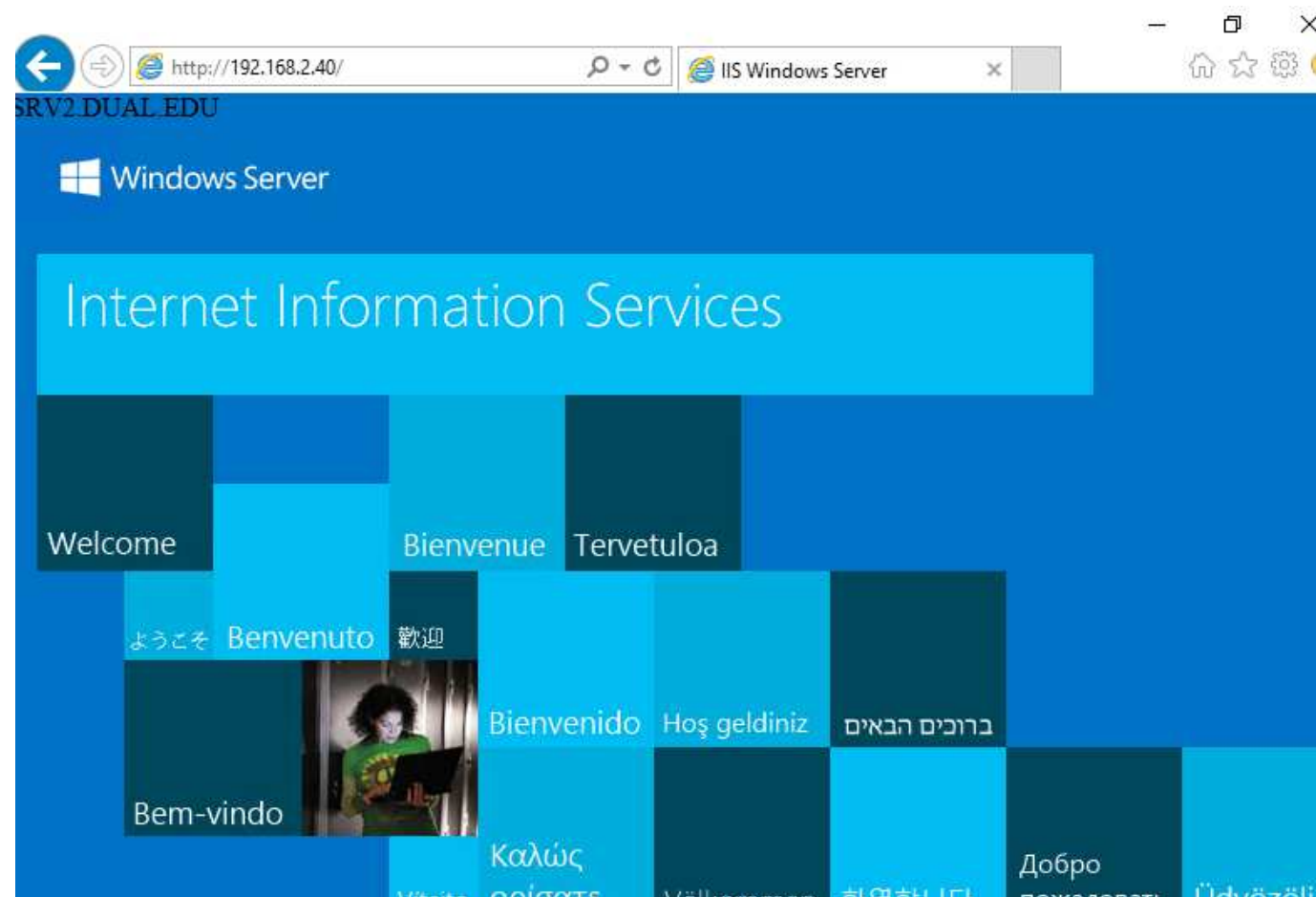
Failover / HA test

::2. Disable active node z NLB konzoly



Failover / HA test

::3. Refresh stránky z NLB konzoly



NEXT

::NLB cluster

<https://docs.microsoft.com/en-us/windows-server/networking/technologies/network-load-balancing>