

VISOKO UČILIŠTE ALGEBRA

PROJEKTNI ZADATAK

Operacijski sustavi: mrežna infrastruktura i servisi

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Zagreb, svibanj 2020.

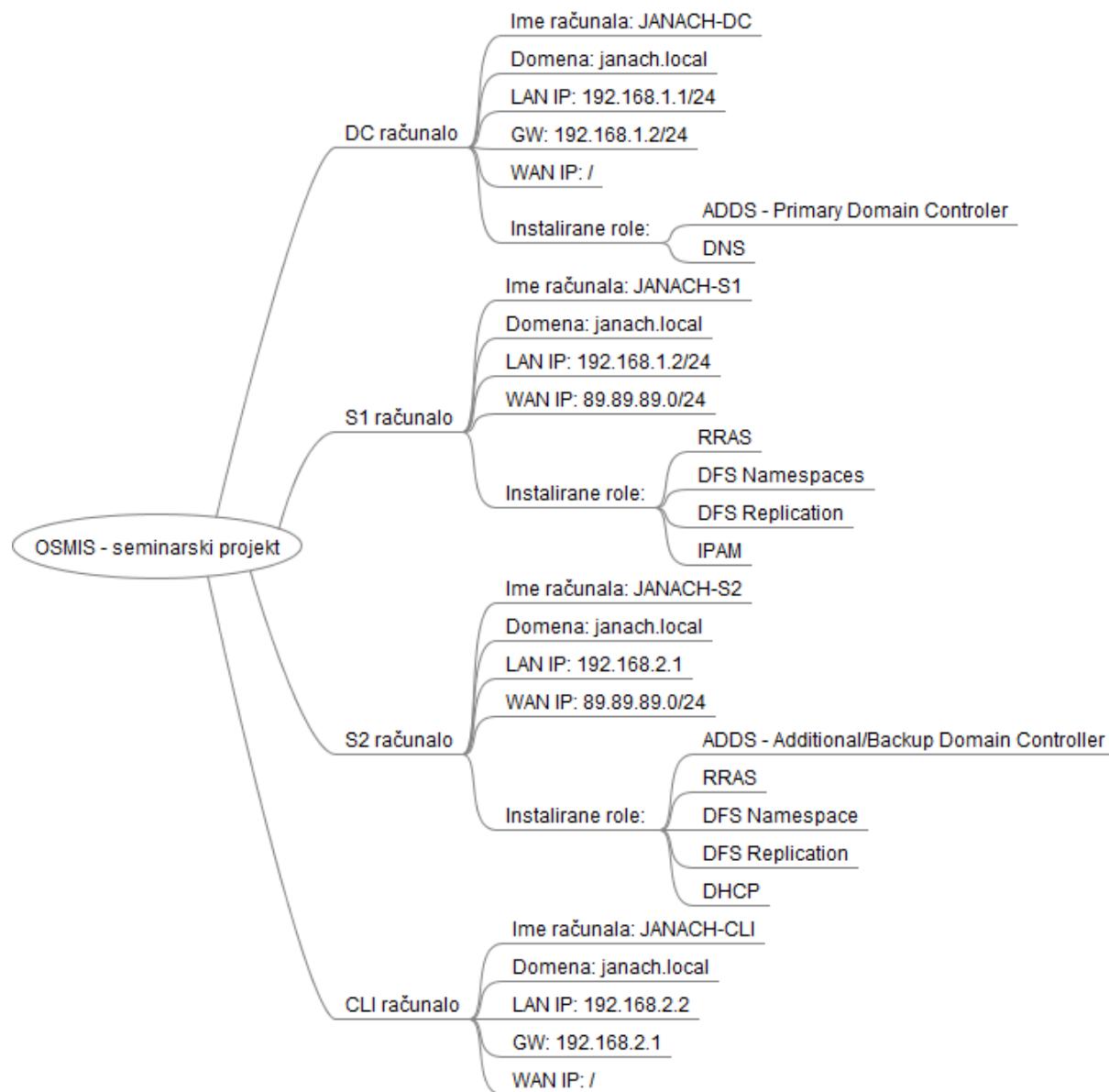
Sadržaj

1.	Sažetak	1
2.	Opis infrastrukture.....	2
3.	Topologija infrastrukture	3
4.	Razrada projekta – projektno rješenje.....	4
4.1.	Postavljanje domene.....	4
4.2.	Uspostava L2TP tunela.....	7
4.2.1.	Kreiranje Demand-dial interface-a.....	10
4.3.	Instalacija DFS-a	12
4.4.	IPAM.....	17
5.	Popis slika.....	21
6.	Reference	21

1. Sažetak

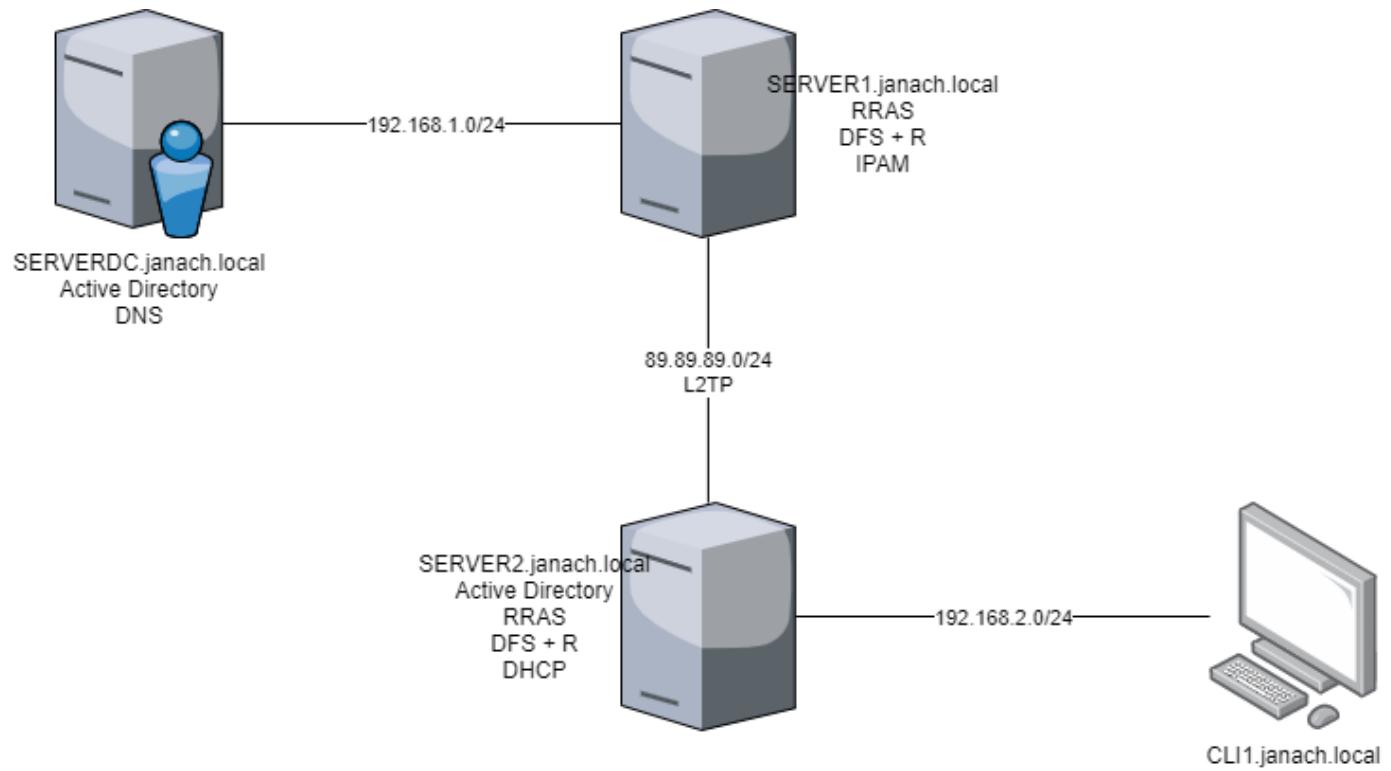
Za potrebe rješavanja zadataka koji su navedeni u projektu koristit će se računala: DC, S1, S2 i CLI. Kao prijedlog projektnog zadatka odabrana je prva točka u kojem će se povezati dvije lokacije korištenjem L2TP(Layer 2 Tunneling Protocol) tunela. Postaviti DFS(Distributed File System) kako bi obje lokacije imale pristup dijeljenim podacima. Pri završetku prve točke zadatka slijedi implementacija IPAM-a(IP Address Management), gdje je u AD potrebno dodati 30 „Computer“ objekata, u DNS-u im pridodati IP adrese koje su razbacane po *subnetima* i podići DHCP server za oba sajta. Struktura rješenja infrastrukture, popis instaliranih uloga, IP adresa te ostalih karakteristika svakog računala može se pronaći u poglavlju „Opis infrastrukture“.

2. Opis infrastrukture



Slika 1: opis infrastrukture

3. Topologija infrastrukture

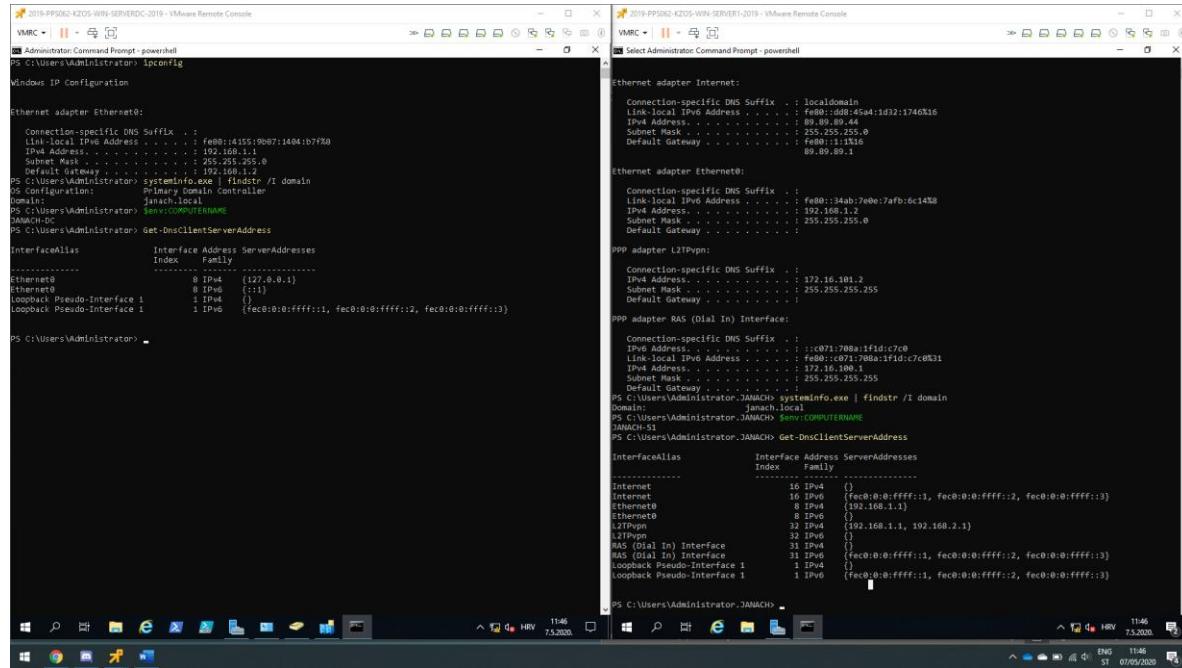


Slika 2: topologija infrastrukture

4. Razrada projekta – projektno rješenje

4.1. Postavljanje domene

Prije uspostave L2TP tunela i DFS-a potrebno je dodati S2 računalo u domenu kao „Domain Controller“. Kad smo dodali S2 DC u domenu potrebno je uspostaviti L2TP tunel (više u „Uspostava L2TP tunela“). Nakon uspostave tunela potrebno je konfigurirati mrežne kartice, nazive računala, „AD Sites and Services“ na DC računalu. Na kraju kad je sve uspješno postavljeno dodati CLI1 računalo u domenu.



```
Administrator: Command Prompt - powershell
PS C:\Users\Administrator> ipconfig

Windows IP Configuration

Ethernet adapter Ethernet0:
  Connection-specific DNS Suffix . : localdomain
  Link-local IPv6 Address . . . . . : fe80::6a0a:3faf%1:1
  IPv4 Address . . . . . : 192.168.1.2
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : 192.168.1.1
PS C:\Users\Administrator> systeminfo.exe | findstr /I domain
OS Configuration:          Primary Domain Controller
Domain:                   janach.local
PS C:\Users\Administrator> $env:COMPUTERNAME
JANACH-S2
PS C:\Users\Administrator> Get-DnsClientServerAddress

InterfaceAlias      InterfaceAddress ServerAddresses
Index           Family
-----      -----
Ethernet0          0 IPv4       {127.0.0.1}
Ethernet0          0 IPv6       {}
Loopback Pseudo-Interface 1 1 IPv4       {}
Loopback Pseudo-Interface 1 1 IPv6       {fec0:0:0:ffff::1, fec0:0:0:ffff::2, fec0:0:0:ffff::3}

PS C:\Users\Administrator>

Administrator: Command Prompt - powershell
PS C:\Users\Administrator> ipconfig

Windows IP Configuration

Ethernet adapter Internet:
  Connection-specific DNS Suffix . : localdomain
  Link-local IPv6 Address . . . . . : fe80::34ab:7e0e:7af8:6c14%16
  IPv4 Address . . . . . : 192.168.1.2
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : fe80::1:1%16
  89.89.89.1

Ethernet adapter Ethernet0:
  Connection-specific DNS Suffix . : localdomain
  Link-local IPv6 Address . . . . . : fe80::34ab:7e0e:7af8:6c14%18
  IPv4 Address . . . . . : 192.168.1.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : fe80::1:1%18

PPP adapter L2TPppn:
  Connection-specific DNS Suffix . :
  IPv4 Address . . . . . : 172.16.101.2
  Subnet Mask . . . . . : 255.255.255.255
  Default Gateway . . . . . :

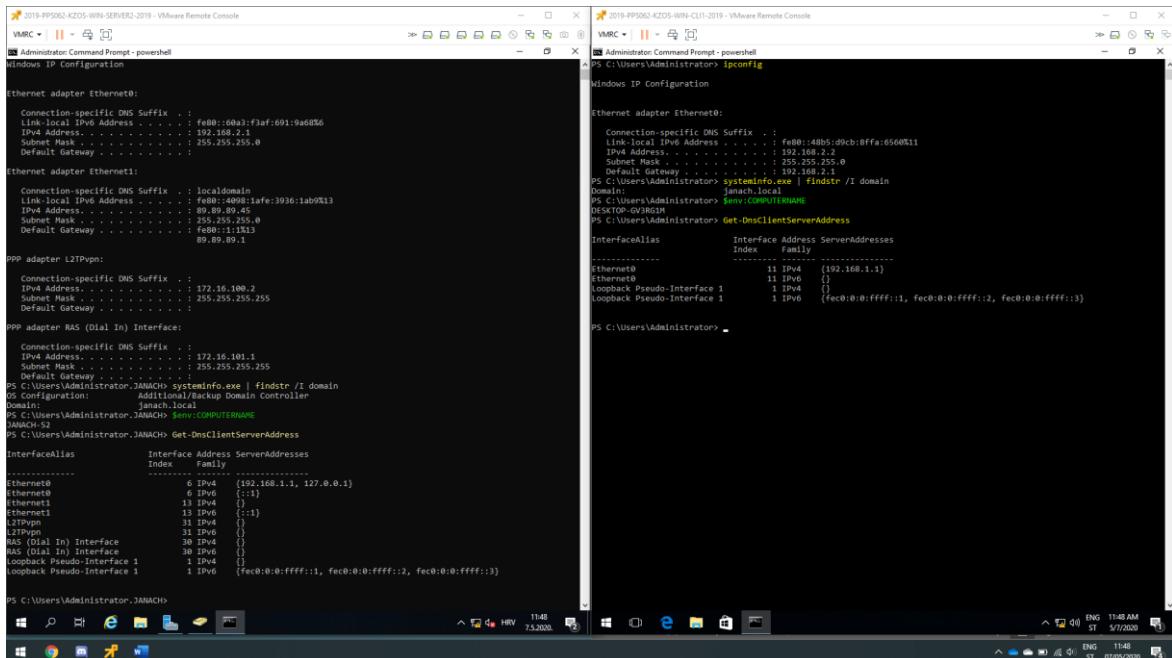
PPP adapter RAS (Dial In) Interface:
  Connection-specific DNS Suffix . :
  IPv4 Address . . . . . : 192.168.1.1
  Subnet Mask . . . . . : 255.255.255.255
  Default Gateway . . . . . : fe80::c717:708a%1:1

PS C:\Users\Administrator> systeminfo.exe | findstr /I domain
Domain:                   janach.local
PS C:\Users\Administrator> $env:COMPUTERNAME
JANACH-S1
PS C:\Users\Administrator> Get-DnsClientServerAddress

InterfaceAlias      InterfaceAddress ServerAddresses
Index           Family
-----      -----
Internet          10 IPv4       {}
Internet          10 IPv6       {fec0:0:0:ffff::1, fec0:0:0:ffff::2, fec0:0:0:ffff::3}
Ethernet0          8 IPv4       {192.168.1.1}
Ethernet0          8 IPv6       {}
L2TPppn           32 IPv4       {192.168.1.1, 192.168.2.1}
L2TPppn           32 IPv6       {}
RAS (Dial In) Interface 31 IPv6       {fec0:0:0:ffff::1, fec0:0:0:ffff::2, fec0:0:0:ffff::3}
Loopback Pseudo-Interface 1 1 IPv4       {}
Loopback Pseudo-Interface 1 1 IPv6       {fec0:0:0:ffff::1, fec0:0:0:ffff::2, fec0:0:0:ffff::3}

PS C:\Users\Administrator>
```

Slika 3: osnovna konfiguracija DC i S1 računala



```
Administrator: Command Prompt - powershell
PS C:\Users\Administrator> ipconfig

Windows IP Configuration

Ethernet adapter Ethernet0:
  Connection-specific DNS Suffix . : localdomain
  Link-local IPv6 Address . . . . . : fe80::4090:1afe%3:1:1
  IPv4 Address . . . . . : 192.168.2.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : 192.168.2.1

Ethernet adapter Ethernet1:
  Connection-specific DNS Suffix . : localdomain
  Link-local IPv6 Address . . . . . : fe80::4090:1afe%3:1ab9%3
  IPv4 Address . . . . . : 192.168.2.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : fe80::1:1%13
  89.89.89.1

PPP adapter L2TPppn:
  Connection-specific DNS Suffix . :
  IPv4 Address . . . . . : 172.16.100.2
  Subnet Mask . . . . . : 255.255.255.255
  Default Gateway . . . . . :

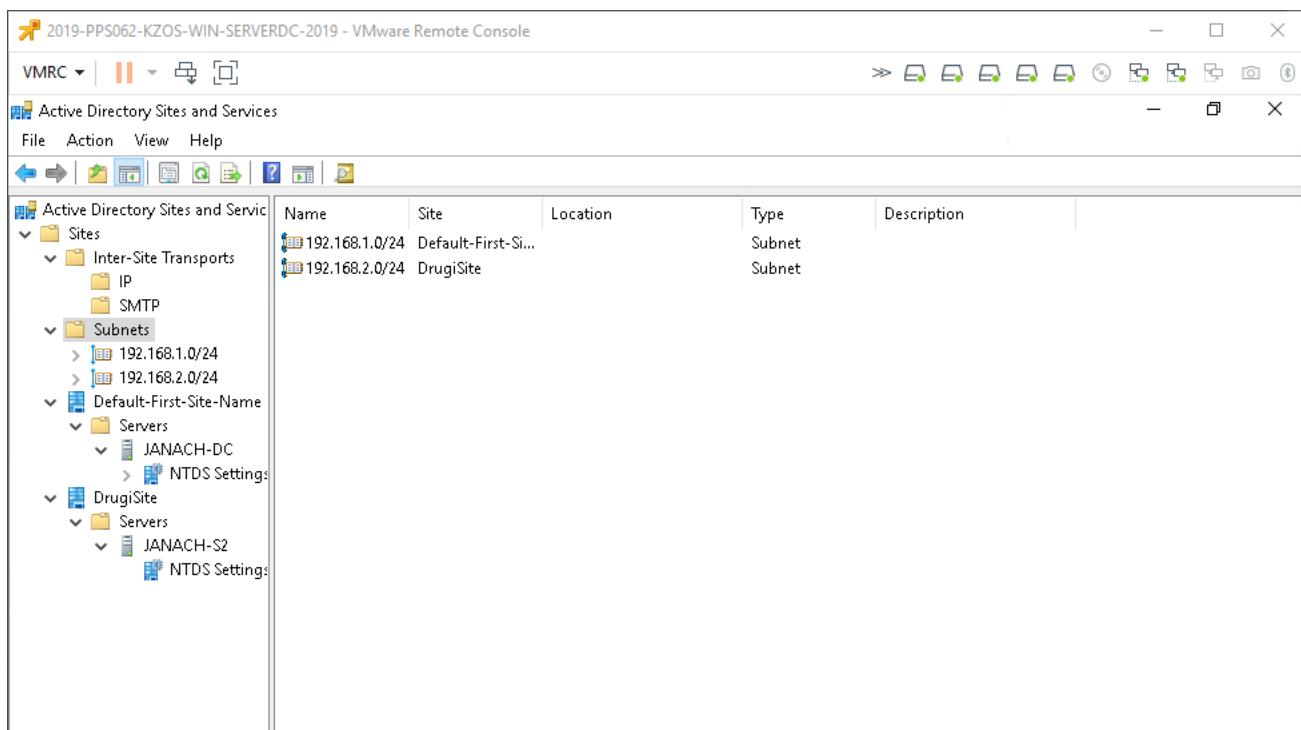
PPP adapter RAS (Dial In) Interface:
  Connection-specific DNS Suffix . :
  IPv4 Address . . . . . : 172.16.101.1
  Subnet Mask . . . . . : 255.255.255.255
  Default Gateway . . . . . : fe80::480d:d0cb:8ffa:656d%11

PS C:\Users\Administrator> systeminfo.exe | findstr /I domain
OS Configuration:          Additional/Backup Domain Controller
Domain:                   janach.local
PS C:\Users\Administrator> $env:COMPUTERNAME
JANACH-S2
PS C:\Users\Administrator> Get-DnsClientServerAddress

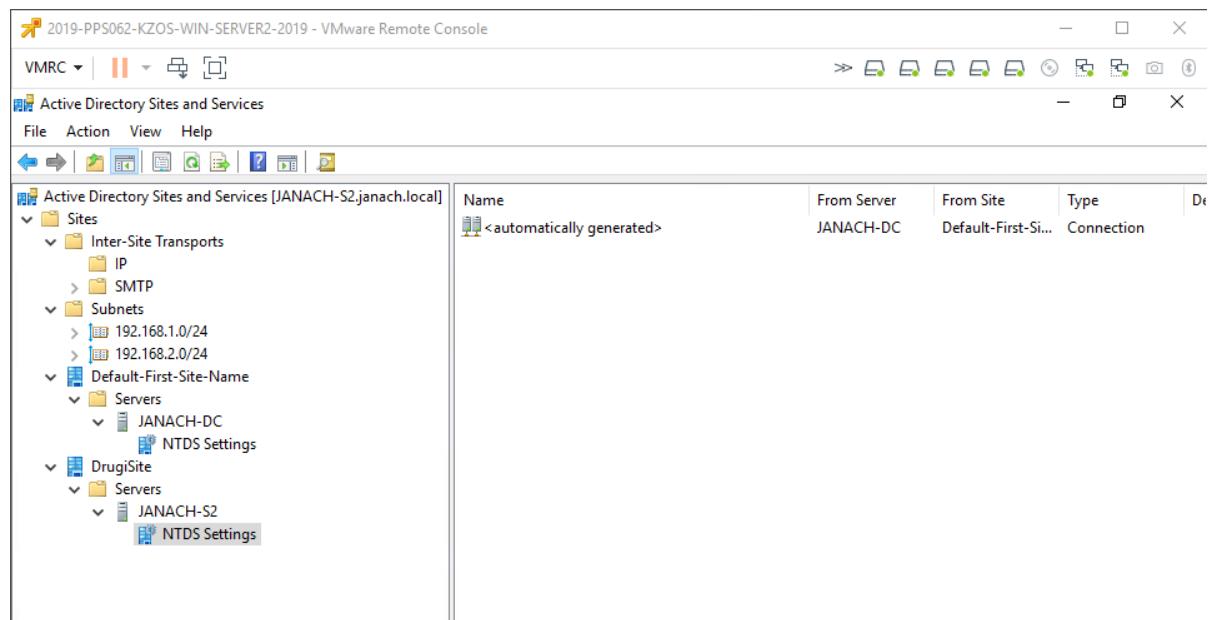
InterfaceAlias      InterfaceAddress ServerAddresses
Index           Family
-----      -----
Ethernet0          6 IPv4       {192.168.1.1, 127.0.0.1}
Ethernet0          6 IPv6       {}
Ethernet1          13 IPv4       {}
Ethernet1          13 IPv6       {}
L2TPppn           31 IPv4       {}
L2TPppn           31 IPv6       {}
RAS (Dial In) Interface 39 IPv4       {}
RAS (Dial In) Interface 39 IPv6       {}
Loopback Pseudo-Interface 1 1 IPv4       {}
Loopback Pseudo-Interface 1 1 IPv6       {fec0:0:0:ffff::1, fec0:0:0:ffff::2, fec0:0:0:ffff::3}

PS C:\Users\Administrator>
```

Slika 4: osnovna konfiguracija S2 i CLI1 računala



Slika 5: prikaz konfiguracije "AD Sites and Services" na SERVERDC računalu



Slika 6: prikaz konfiguracije "AD Sites and Services" na SERVER2 računalu

Servers:

- 2019-PPS062-KZOS-WIN-SERVERDC-2019
- 2019-PPS062-KZOS-WIN-SERVER2-2019

DNS Manager

Name	Type	Data	Timestamp
_msdcs	Start of Authority (SOA)	[65],janach-dc.janach.local.	static
_sites	Name Server (NS)	janach-dc.janach.local.	static
_tcp	(same as parent folder)	Host (A)	192.168.2.1
_udp	(same as parent folder)	Host (A)	192.168.1.1
DomainDnsZones	(same as parent folder)	Host (A)	192.168.1.3
ForestDnsZones	(same as parent folder)	Host (A)	192.168.2.2
janach.local	DESKTOP-GV3RG1M	Host (A)	192.168.2.2
_msdcs	JANACH-CLI	Host (A)	192.168.2.2
_sites	janach-dc	Host (A)	192.168.1.1
_tcp	JANACH-S1	Host (A)	192.168.1.2
_udp	JANACH-S2	Host (A)	192.168.2.1
DomainDnsZones	JANACH-S2	Host (A)	89.89.89.45
ForestDnsZones			
Reverse Lookup Zones			
1.168.192.in-addr.ap			
2.168.192.in-addr.ap			
Trust Points			
Conditional Forwarders			

Slika 7: prikaz DNS konfiguracije na SERVERDC računalu

Servers:

- 2019-PPS062-KZOS-WIN-SERVERDC-2019
- 2019-PPS062-KZOS-WIN-SERVER2-2019

DNS Manager

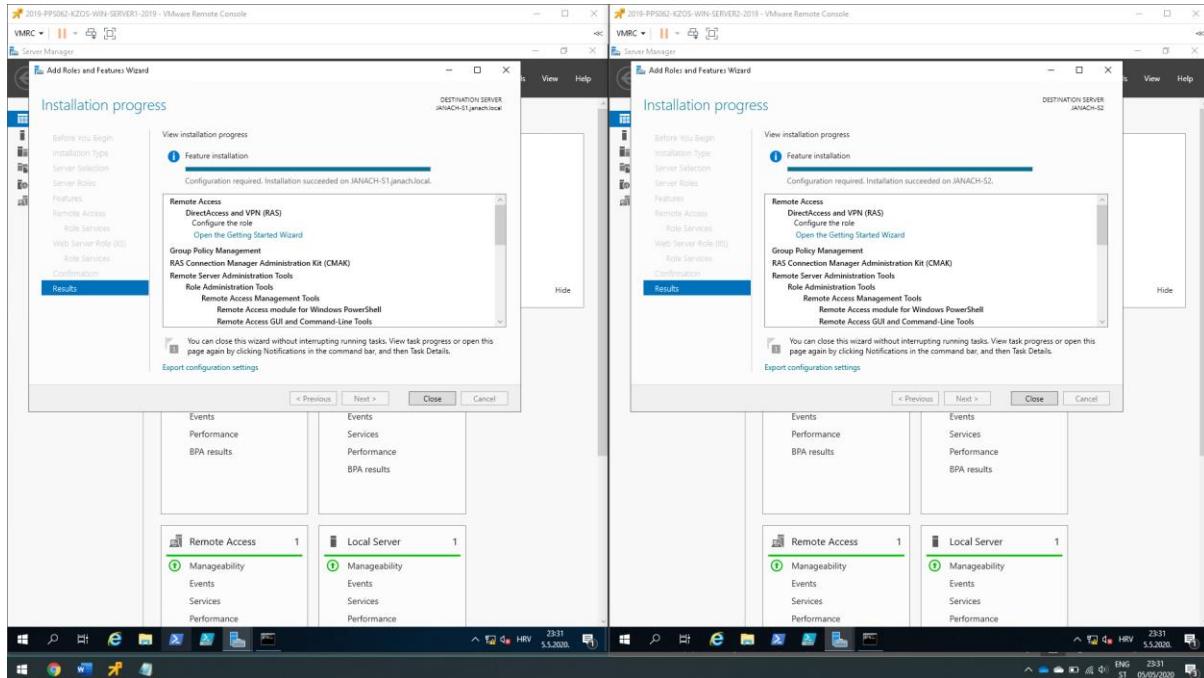
Name	Type	Data	Timestamp
_msdcs	Start of Authority (SOA)	[118],janach-s2.janach.lo...	static
_sites	Name Server (NS)	janach-dc.janach.local.	static
_tcp	(same as parent folder)	Name Server (NS)	janach-s2.janach.local.
_udp	(same as parent folder)	Host (A)	89.89.89.45
DomainDnsZones	(same as parent folder)	Host (A)	192.168.2.1
ForestDnsZones	(same as parent folder)	Host (A)	192.168.1.1
janach.local	janach-dc	Host (A)	192.168.1.1
_msdcs	JANACH-S1	Host (A)	192.168.1.2
_sites	janach-s2	Host (A)	172.16.101.1
_tcp	janach-s2	Host (A)	172.16.100.2
_udp	janach-s2	Host (A)	89.89.89.45
DomainDnsZones	janach-s2	Host (A)	192.168.2.1
ForestDnsZones			
Reverse Lookup Zones			
1.168.192.in-addr.ap			
2.168.192.in-addr.ap			
Trust Points			
Conditional Forwarders			

Slika 8: prikaz DNS konfiguracije na SERVER2 računalu

4.2. Uspostava L2TP tunela

Povezati SERVER1 i SERVER2 računala L2TP tunelom kako bi povezali dvije lokacije DC | S1 i S2 | CLI. Kako bi to bilo ostvarivo potrebno je konfigurirati mrežne kartice, uključiti WAN mrežnu karticu i podignuti RRAS(Remote Access) ulogu na SERVER1 i SERVER2 računalu.

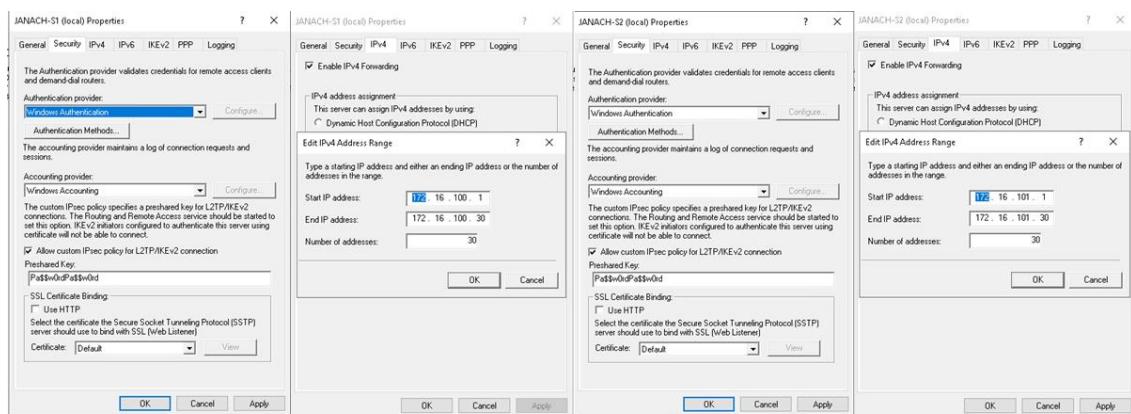
Instalirati RRAS(Direct Access and VPN + routing) ulogu na SERVER1 i SERVER2 računalu i nakon instalacije dovršiti čarobnjak uz odabir VPN deploy.



Slika 9: prikaz instalirane uloge na SERVER1 i SERVER2 računalu

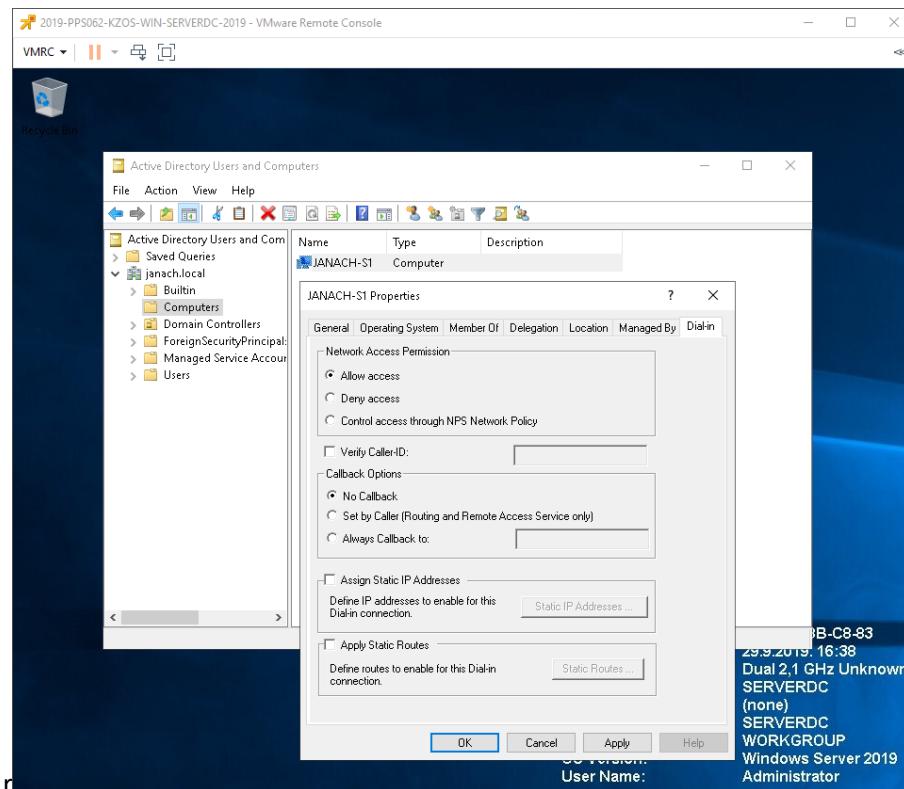
Završenom instalacijom RRAS konzole pokrenuti konfiguraciju: „Custom Configuration“, „VPN Access“ i „Demand-dial Connections“ na SERVER1 i SERVER2.

Podesiti sigurnost i IPV4 postavke na oba računala.

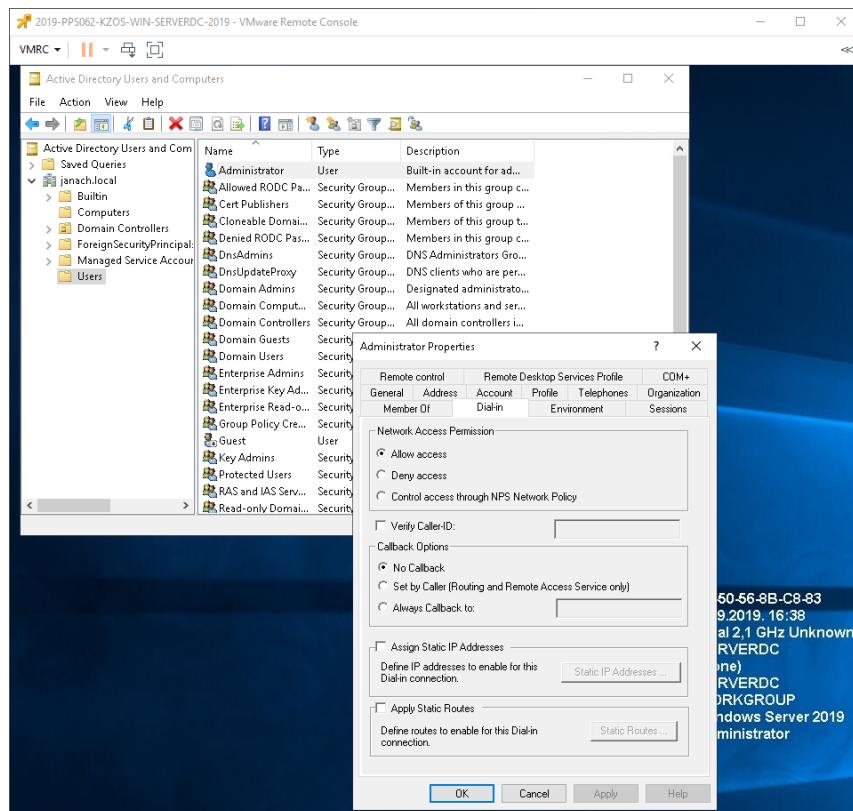


Slika 10: prikaz podešenih sigurnosnih i IPV4 postavki na oba računala

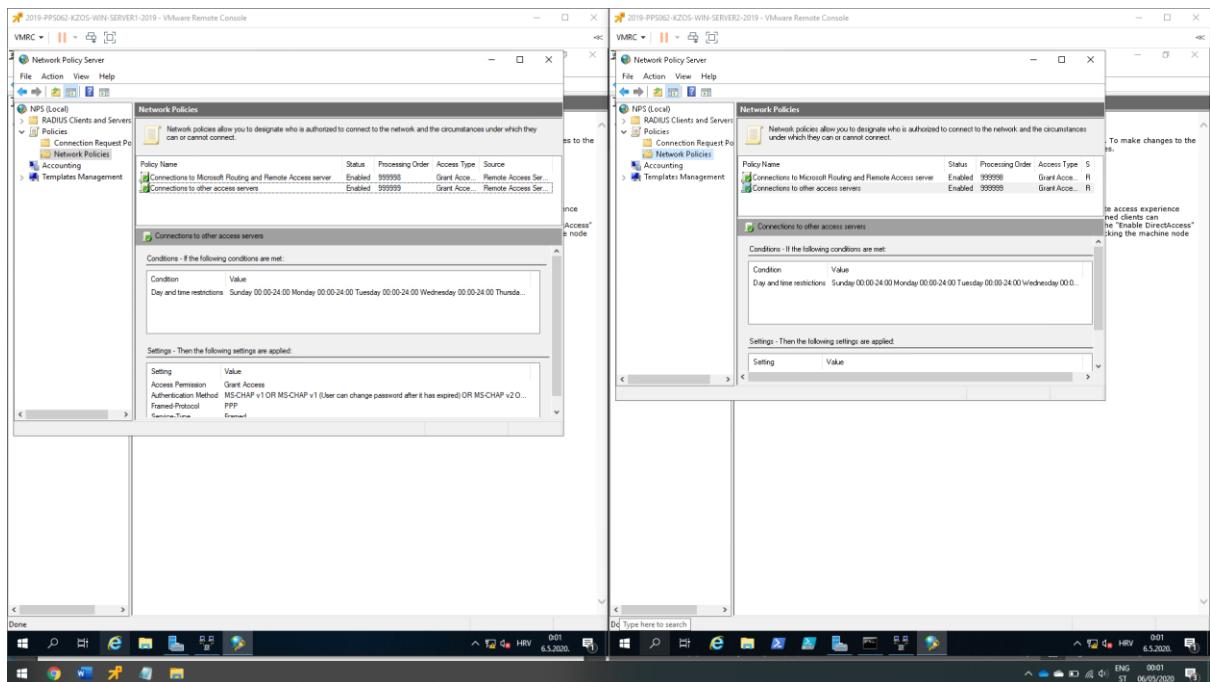
Dial-in se postavlja na SERVERDC računalu.



Slika 11: omogućen Dial-in za SERVER1 računalo



Slika 12: omogućen Dial-in za korisnika administrator

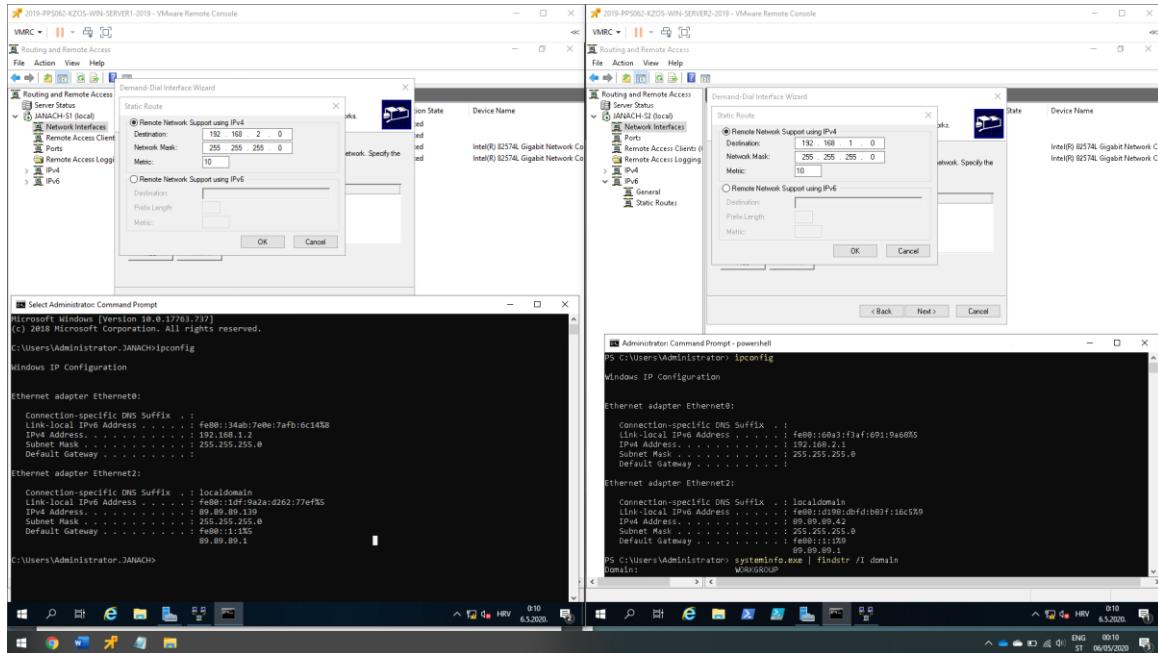


Slika 13: omogućen group policy za RRAS konekcije na SERVER1 i SERVER2 računalu

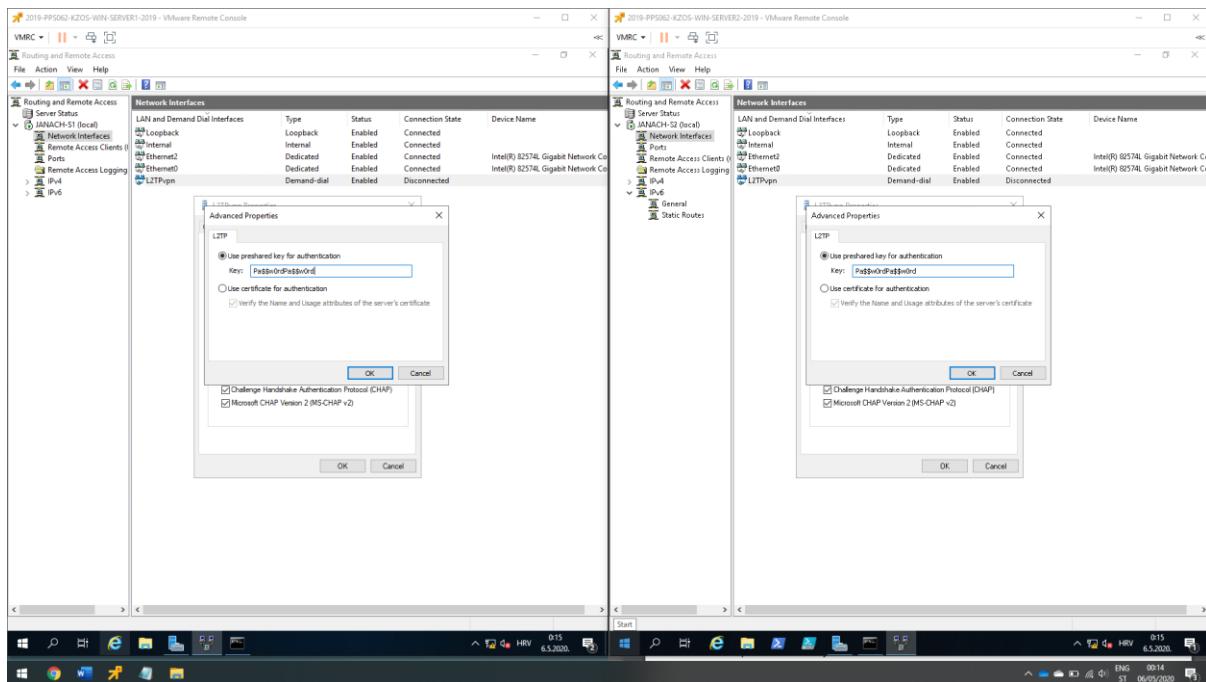
4.2.1. Kreiranje Demand-dial interface-a

Nužno je napraviti novi Demand-dial interface imena L2TPvpn na SERVER1 i SERVER2 računalo kako bi se uspostavio tunel. Pritom paziti na adresu destinacije 89.89.89.0/24.

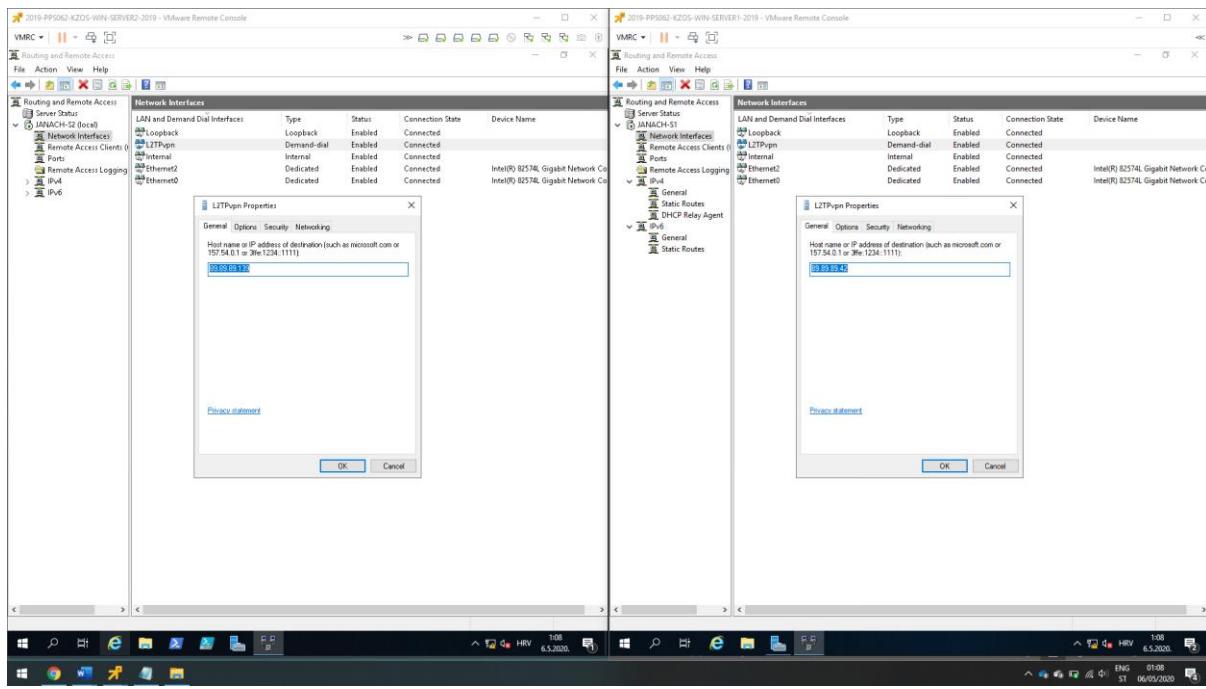
VPN -> L2TPvpn Remote public 89.89.89.0/24 adresa SERVER2 računala -> Dodavanje novog korisnika za Dial-In -> dodavanje statičke rute za remote lokaciju 172.16.101.0/24, metric 10 -> Pa\$wOrd -> Dial-out korisnički podaci: L2TP, Pa\$wOrd



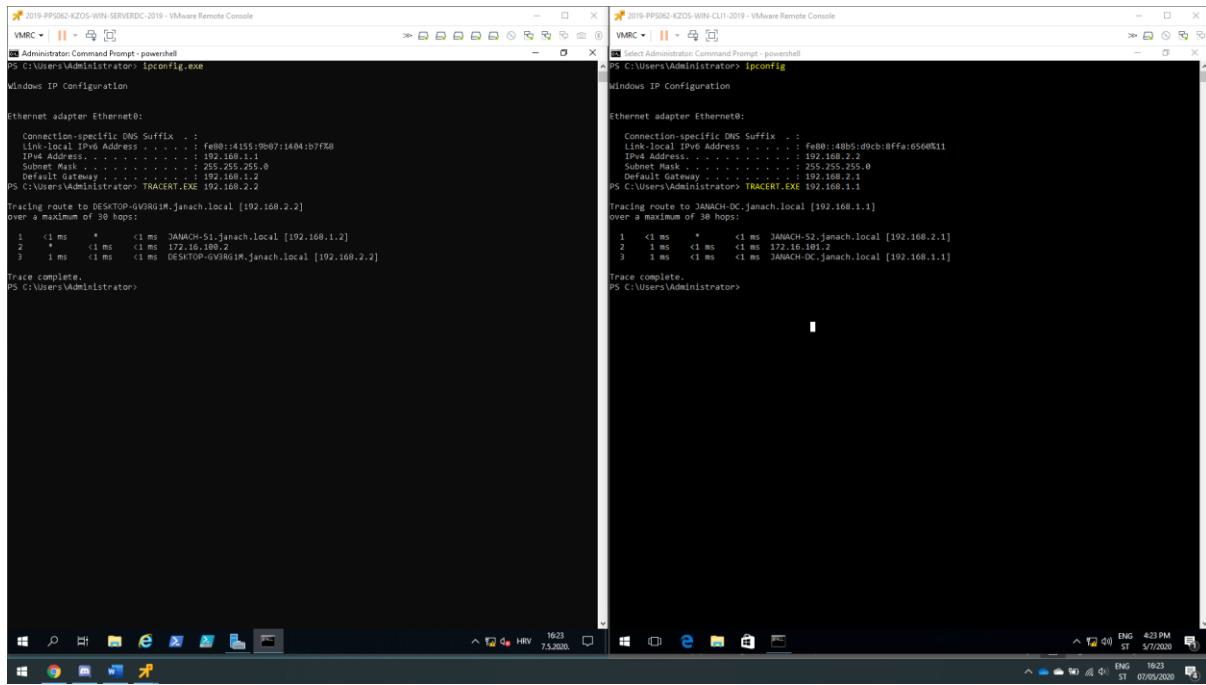
Slika 14: konfiguracija statičke rute



Slika 15: omogućavanje autentifikacije za L2TPvpn Demand-Dial interface



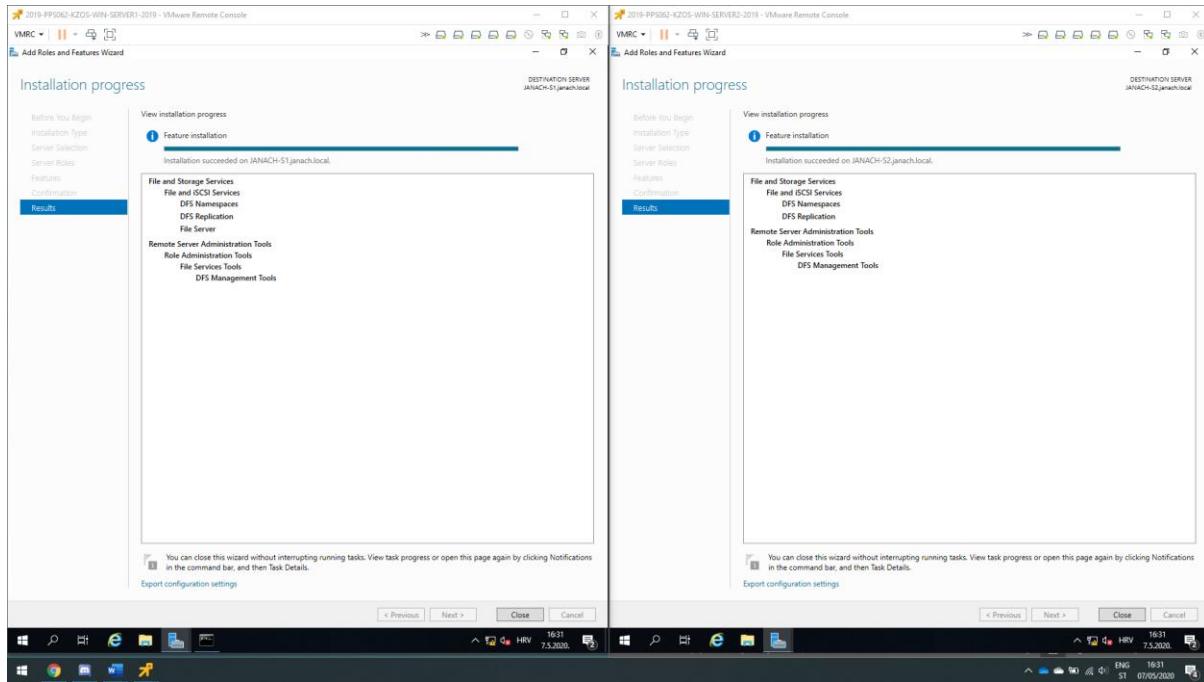
Slika 16: Prikaz uspješne konekcije između SERVER1 i SERVER2 računala L2TPvpn tunelom



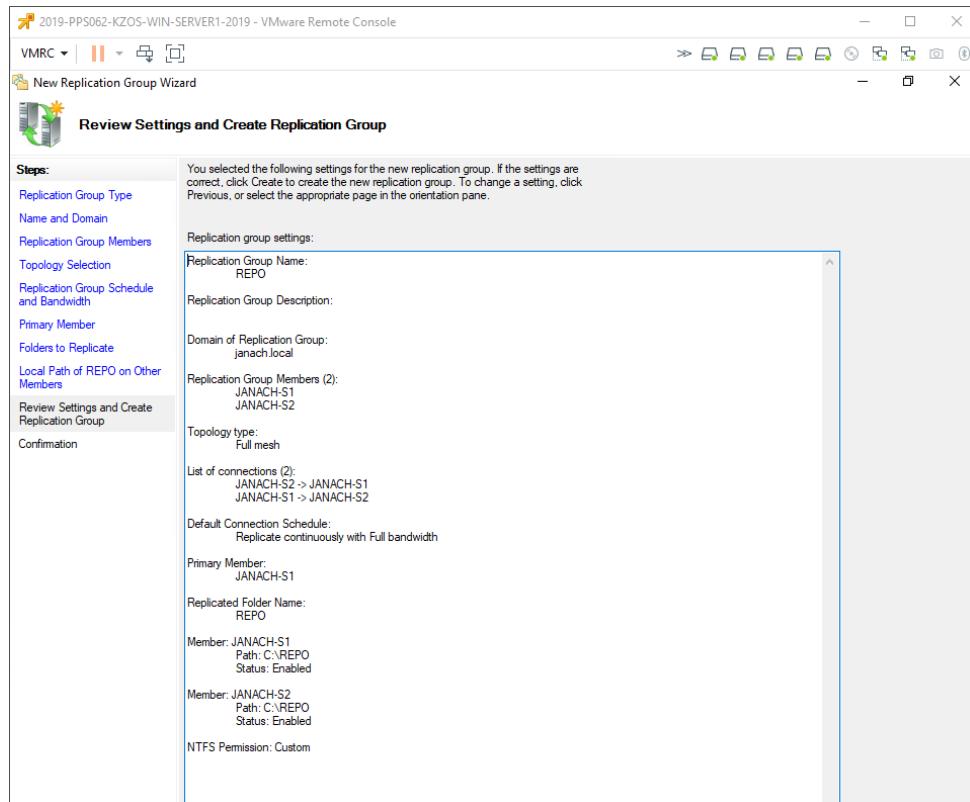
Slika 17: testiranje konekcije između SERVER1 i SERVER2 koristeći tracert naredbom

4.3. Instalacija DFS-a

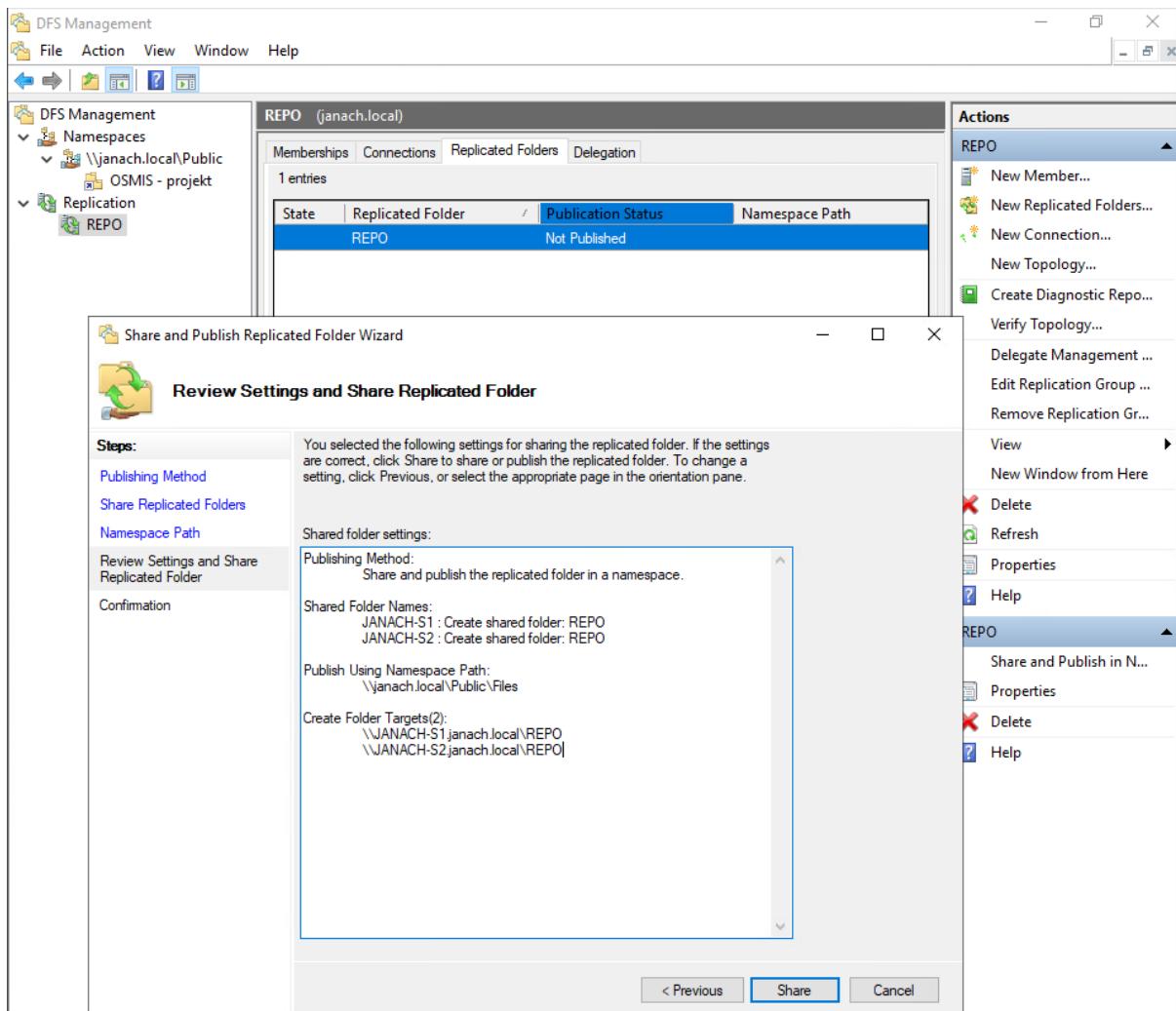
Kad je L2TP tunel uspostavljen potrebno je instalirati DFS uloge na SERVER1 i SERVER2 računalo. Nužno je instalirati „DFS Namespaces“ i „DFS Replication“.



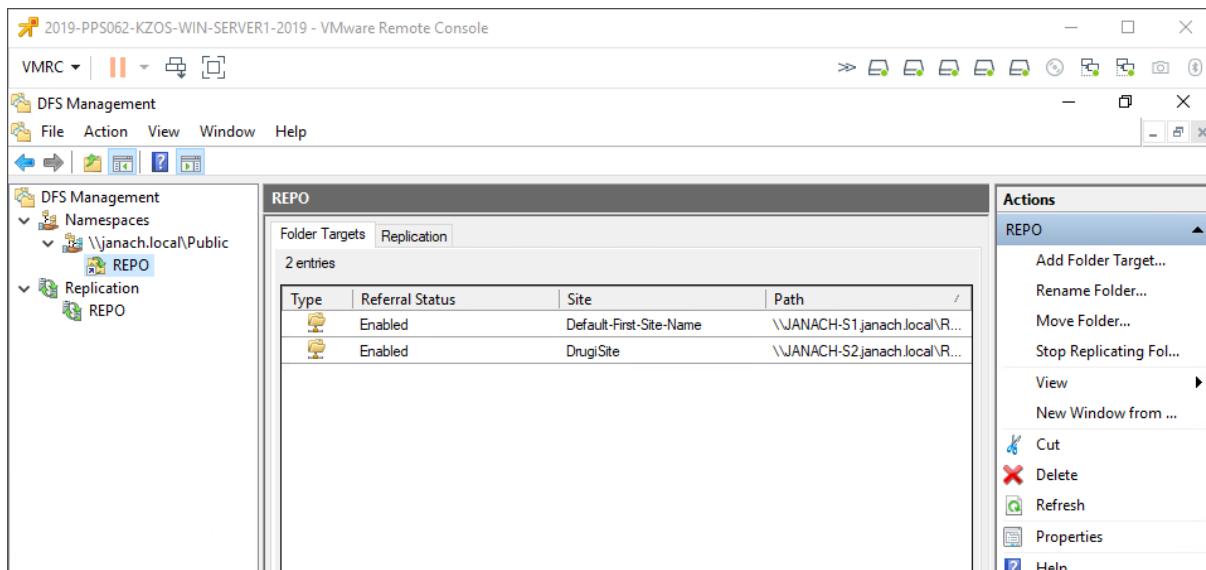
Slika 18: instalacija DFS uloge na SERVER1 i SERVER2



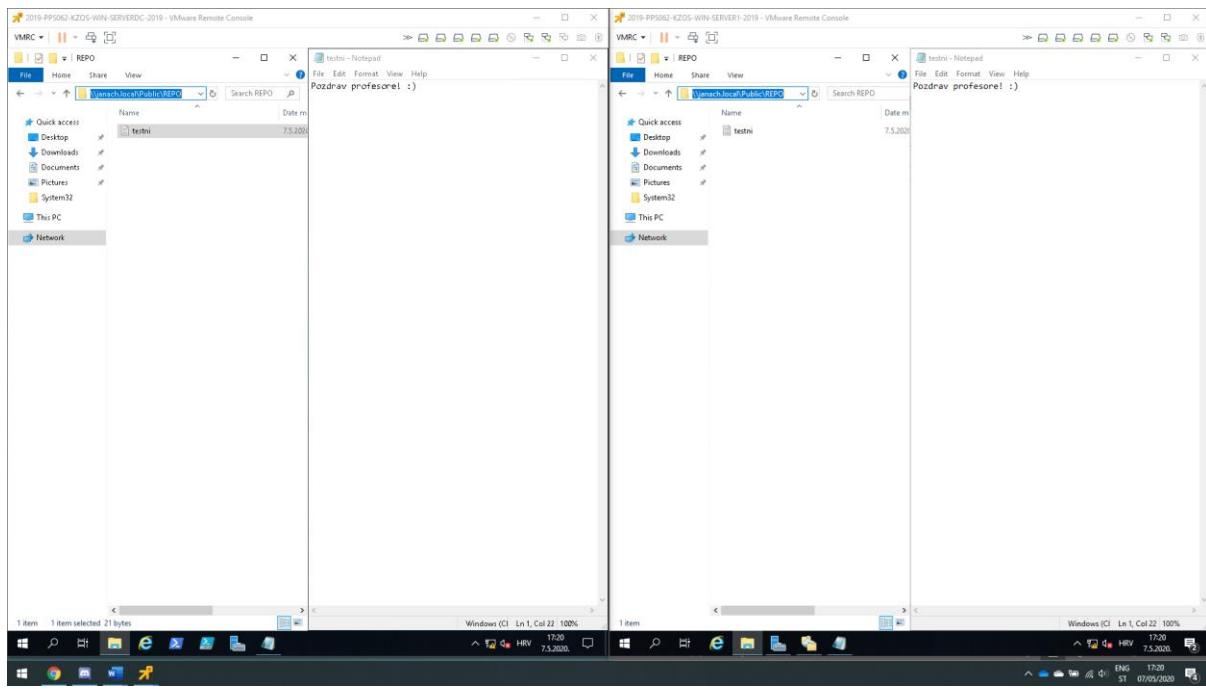
Slika 19: konfiguracija DFS replikacijske grupe



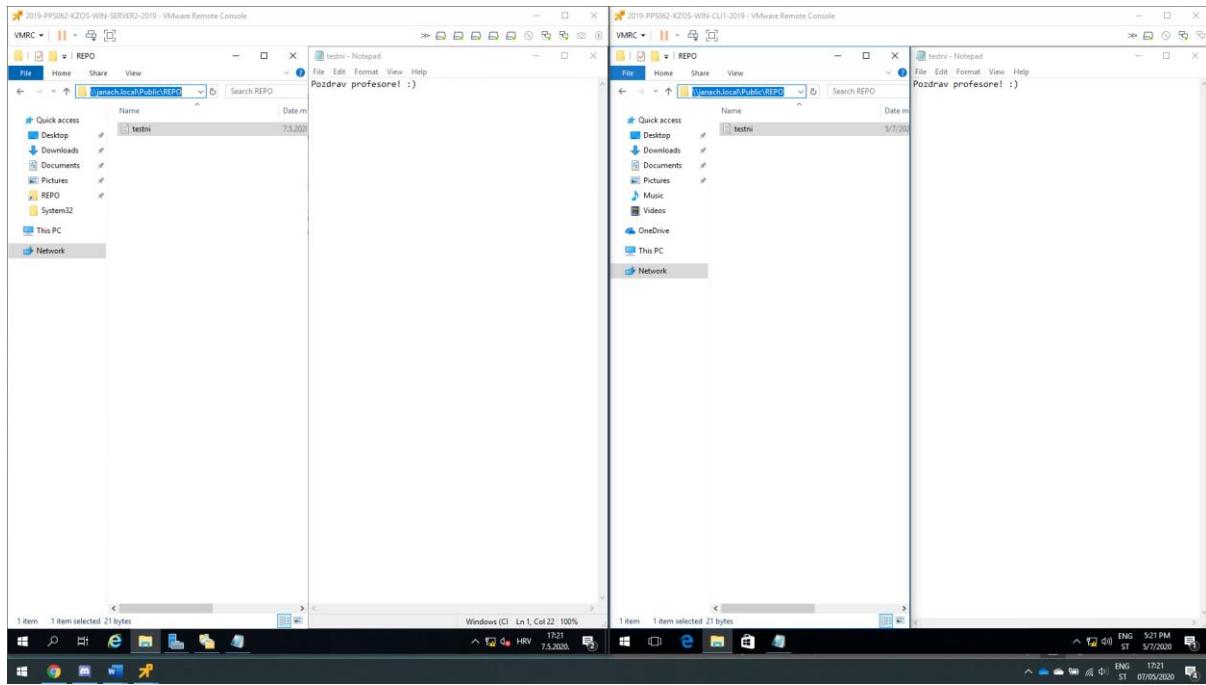
Slika 20: konfiguracija "Share Replicated" foldera



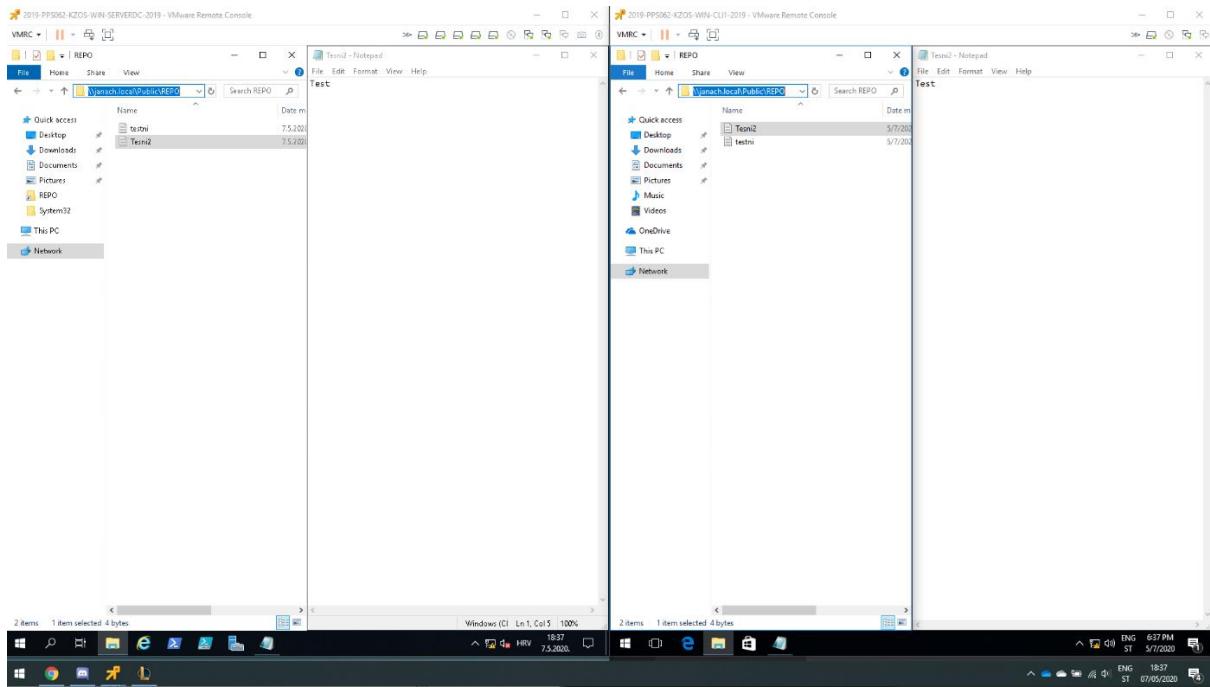
Slika 21: uspješno konfiguirirana replikacija



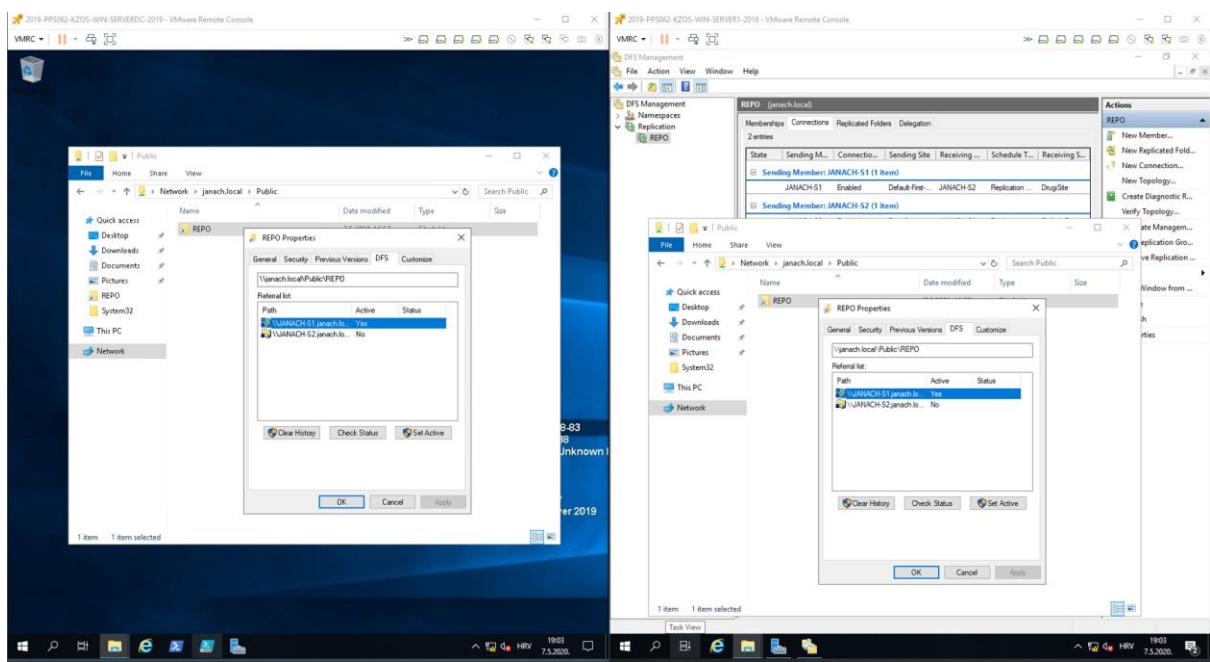
Slika 22: testiranje pristupa podataka sa putanje \\janach.local\Public\REPO (DC i S1)



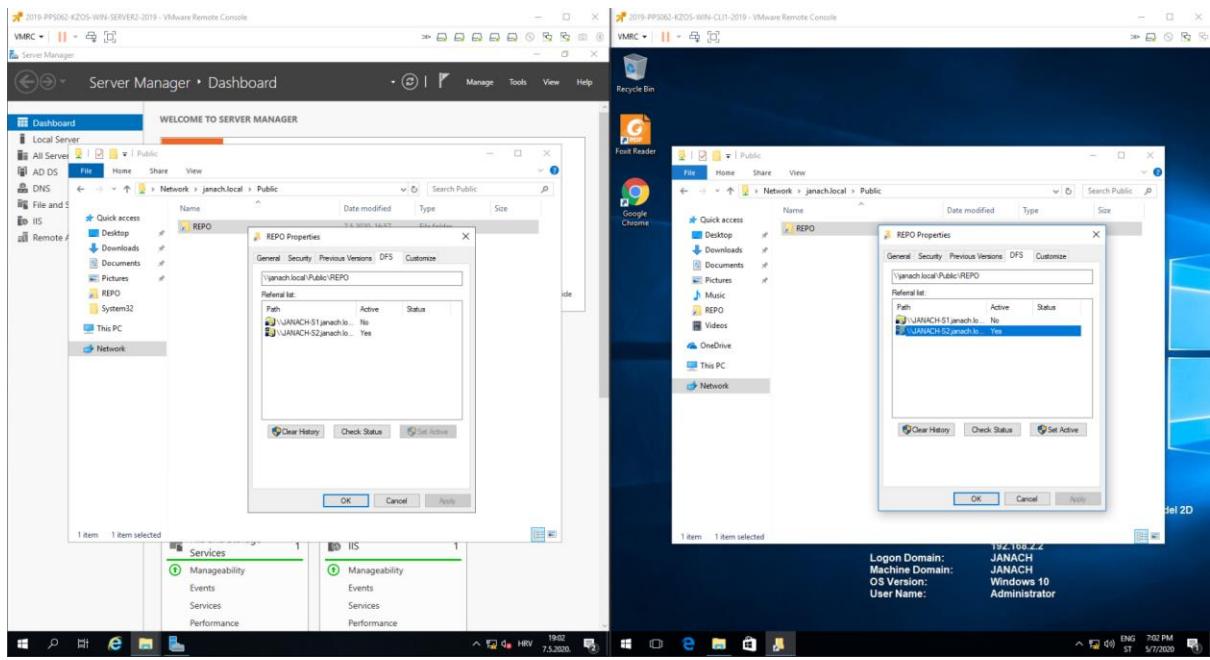
Slika 23: testiranje pristupa podataka sa putanje \\janach.local\Public\REPO (S2 i CLI)



Slika 24: testni pristup podataka sa putanje \\janach.local\\Public\\REPO



Slika 25: na site1 strani odgovoran je SERVER1

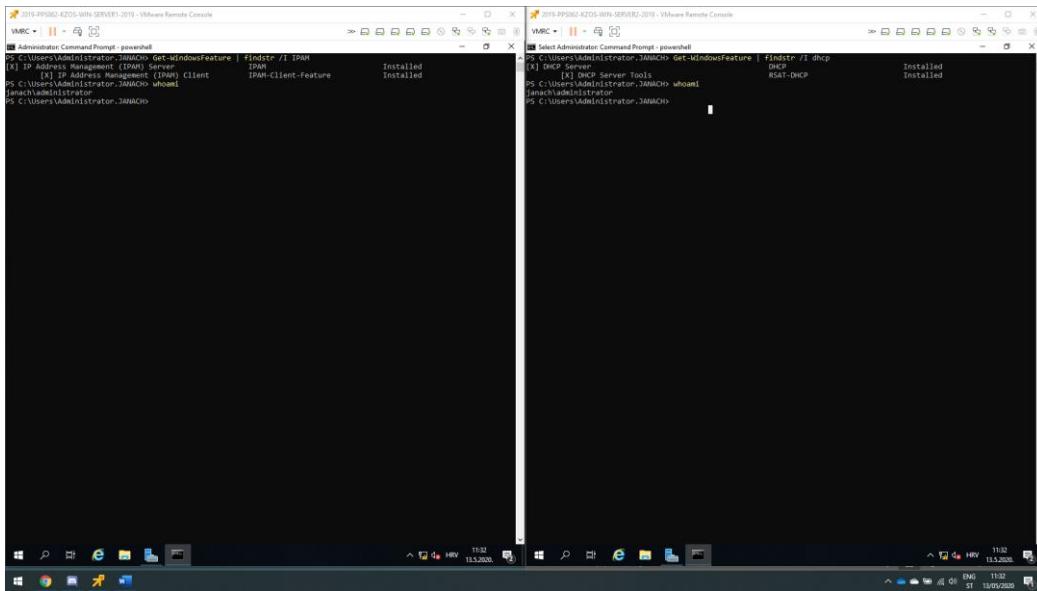


Slika 26: na site2 stranice odgovoran je SERVER2

4.4. IPAM

IPAM infrastruktura za ovaj zadatak: S1 – instalirana IPAM rola, S2 – instalirana DHCP rola. Nakon instaliranih rola i uspješne konfiguracije IPAM-a potrebno je dodati 30 „computer objekata“ i za svaki taj objekt dodijeliti IP adresu u DNS-u. Za kraj sve provjeriti NSlookup naredbom i IPAM-om.

Instalirana DHCP uloga na SERVER2 računalu. Instalirana IPAM uloga na SERVER1 računalu.



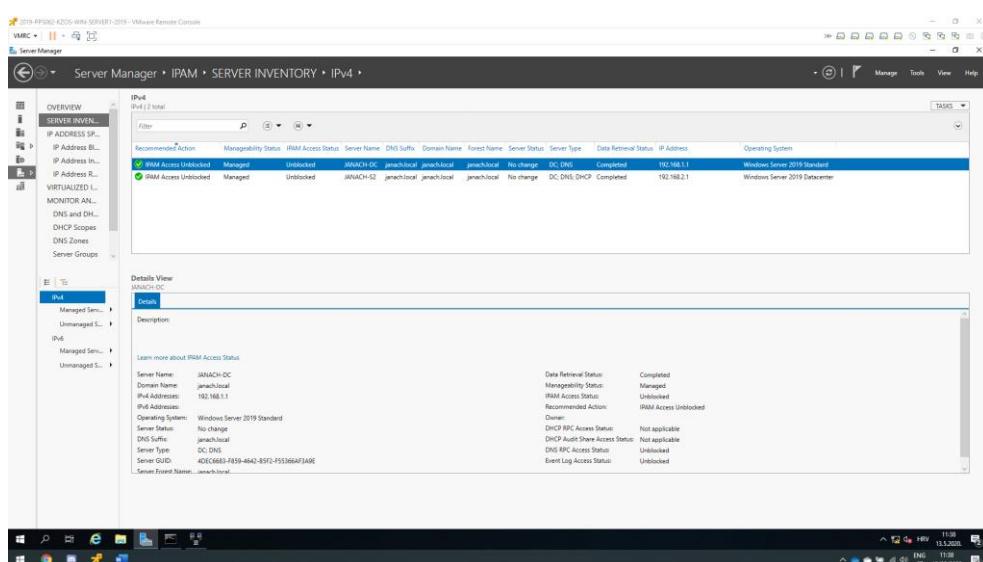
Slika 27: prikaz DHCP i IPAM uloge na SERVER1 računalu

Zatim pokrenuti PowerShell komandu „Invoke-IpamGpoProvisioning“.

Gupdate /force na svim računalima.

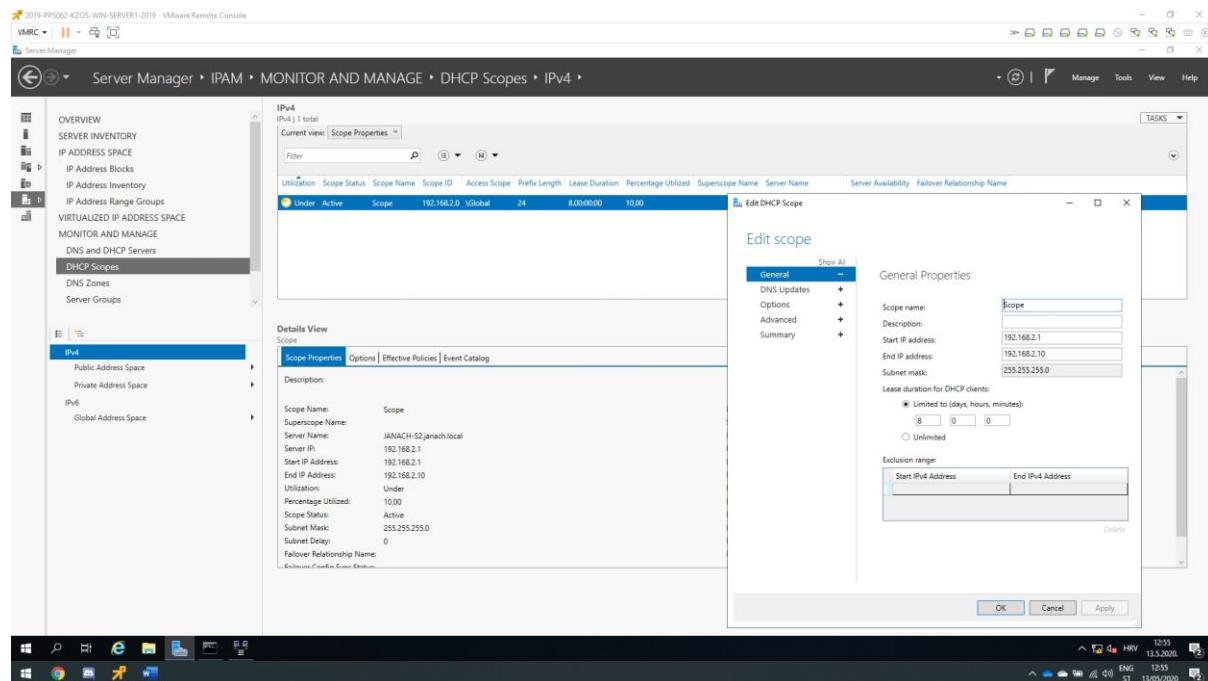
Na SERVER1 gdje je instalirana IPAM uloga potrebno je pokrenuti „Provisioning Wizard“.

Konfigurirati SERVERDC i SERVER2 tako da SERVERDC bude type: DC i DNS, a SERVER2 bude type: DC, DNS i DHCP.



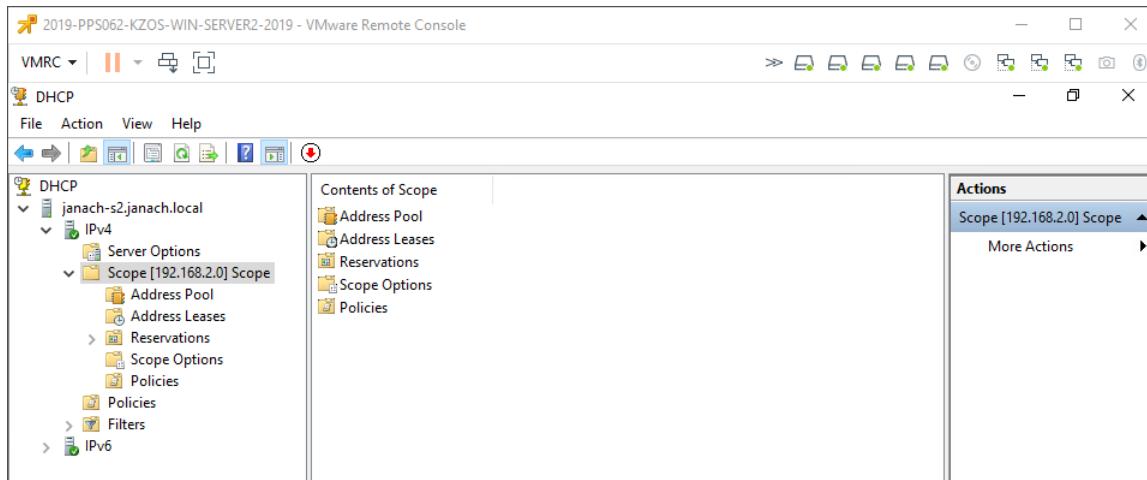
Slika 28: prikaz uspješne konfiguracije

Pomoću IPAM-a kreirati „Scope“ kako bi CLI računalo dobilo IP adresu DHCP-om.

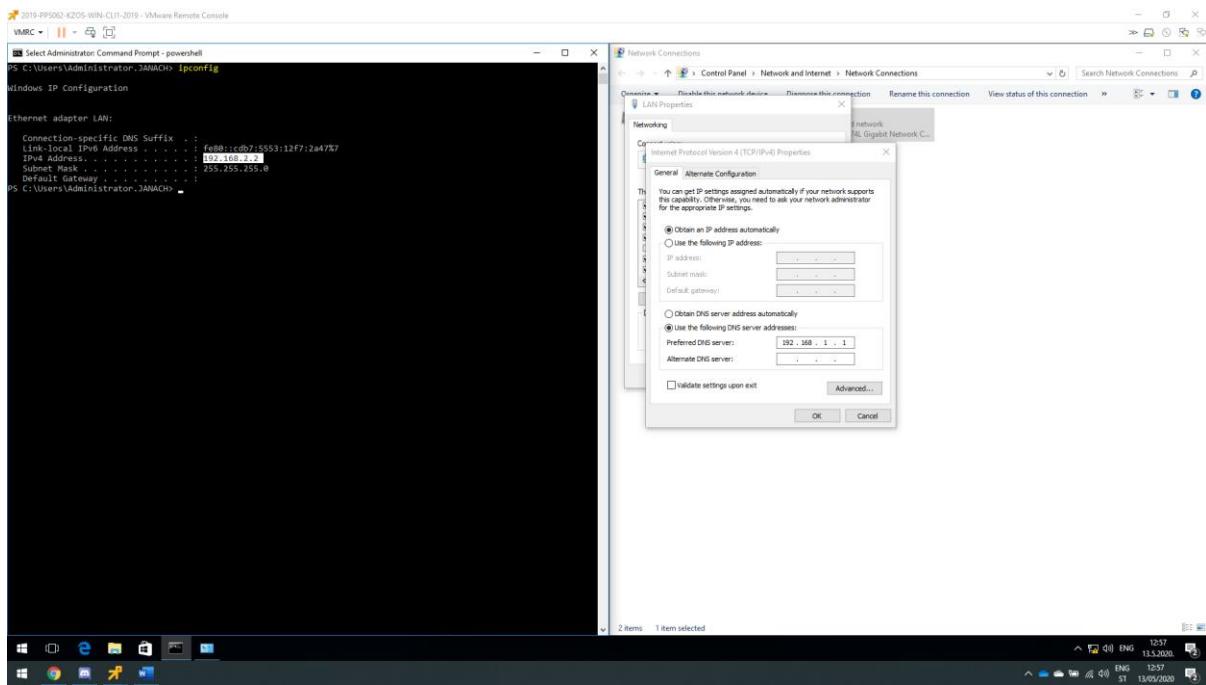


Slika 29: uspješno kreiran "Scope"

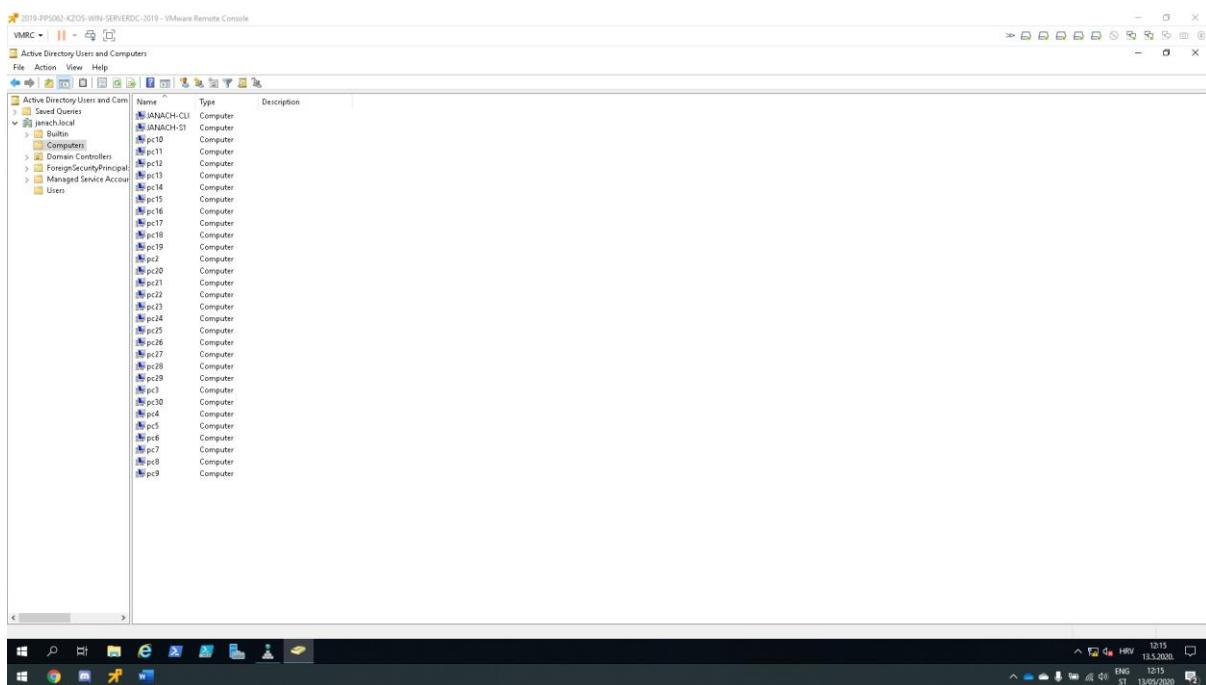
Konfiguracija na IPAM-u uspješno je prenesena na DHCP server računalo(SERVER2).



Slika 30: prijenos konfiguracije na DHCP SERVER2 računalo

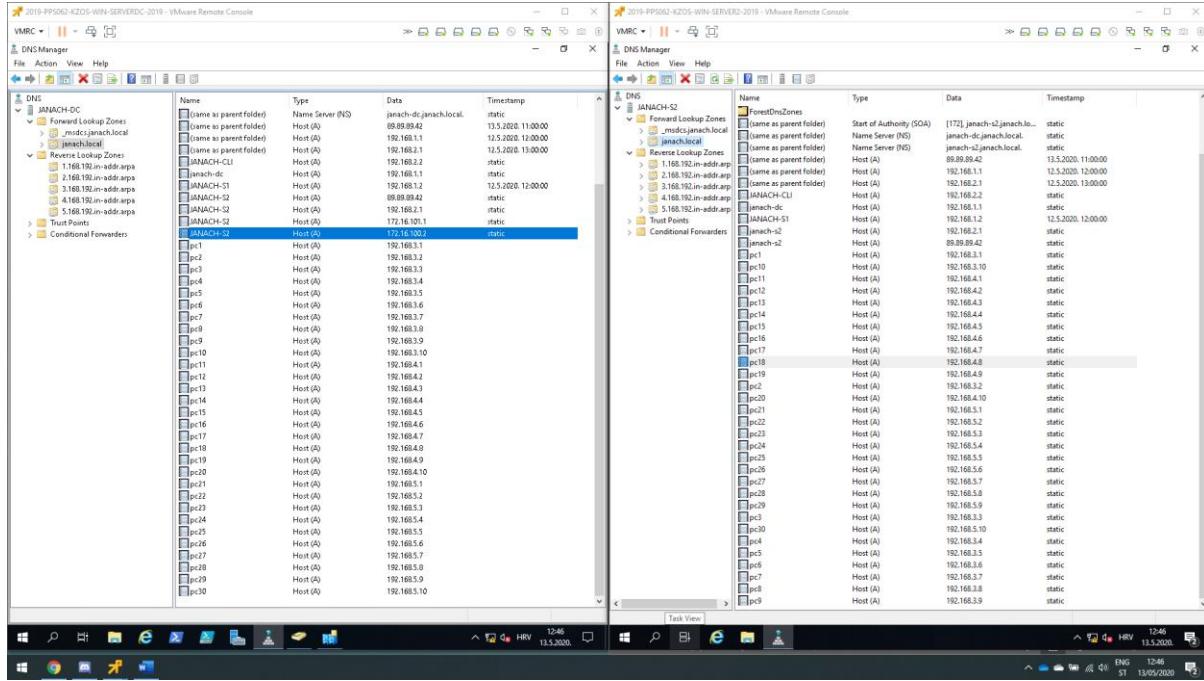


Slika 31: CLI računalu uspješno je dodijeljena IP adresa DHCP-om



Slika 32: prikaz dodanih 30 "Computer" objekata u AD Users and Computers

Svakome dodanome objektu pridodati IP adresu. npr. Za svakih 10 računala dodijeliti IP adrese iz jednog range-a subneta, pa za drugih 10 iz drugog range-a subneta. Zatim provjeriti da li su se DNS zapisi replicirali na S2 DC.



Slika 33: prikaz dodanih 30 "Computer" objekata

```

Administrator Command Prompt - powershell
PS C:\Users\Administrator> nslookup
Default Server: JANACH-DC.janach.local
Address: 192.168.1.1

> 192.168.3.1
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc1.janach.local
Address: 192.168.3.1

> 192.168.3.10
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc10.janach.local
Address: 192.168.3.10

> 192.168.4.1
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc11.janach.local
Address: 192.168.4.1

> 192.168.4.10
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc12.janach.local
Address: 192.168.4.10

> 192.168.5.1
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc13.janach.local
Address: 192.168.5.1

> 192.168.5.10
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc14.janach.local
Address: 192.168.5.10

> 192.168.5.11
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc15.janach.local
Address: 192.168.5.11

> 192.168.5.12
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc16.janach.local
Address: 192.168.5.12

> 192.168.5.13
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc17.janach.local
Address: 192.168.5.13

> 192.168.5.14
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc18.janach.local
Address: 192.168.5.14

> 192.168.5.15
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc19.janach.local
Address: 192.168.5.15

> 192.168.5.16
Server: JANACH-DC.janach.local
Address: 192.168.1.1

Name: pc20.janach.local
Address: 192.168.5.16

```

Slika 34: Test NSlookup naredbom sa SERVER1 i CLI računalima

Ovime završava projektni zadatak.

5. Popis slika

Slika 1: opis infrastrukture	2
Slika 2: topologija infrastrukture	3
Slika 3: osnovna konfiguracija DC i S1 računala	4
Slika 4: osnovna konfiguracija S2 i CLI1 računala.....	4
Slika 5: prikaz konfiguracije "AD Sites and Services" na SERVERDC računalu.....	5
Slika 6: prikaz konfiguracije "AD Sites and Services" na SERVER2 računalu	5
Slika 7: prikaz DNS konfiguracije na SERVERDC računalu	6
Slika 8: prikaz DNS konfiguracije na SERVER2 računalu.....	6
Slika 9: prikaz instalirane uloge na SERVER1 i SERVER2 računalu.....	7
Slika 10: prikaz podešenih sigurnosnih i IPv4 postavka na oba računala.....	7
Slika 11: omogućen Dial-in za SERVER1 računalo	8
Slika 12: omogućen Dial-in za korisnika administrator	8
Slika 13: omogućen group policy za RRAS konekcije na SERVER1 i SERVER2 računalu	9
Slika 14: konfiguracija statičke rute	10
Slika 15: omogućavanje autentifikacije za L2TPvpn Demand-Dial interface	10
Slika 16: Prikaz uspješne konekcije između SERVER1 i SERVER2 računala L2TPvpn tunelom	11
Slika 17: testiranje konekcije između SERVER1 i SERVER2 koristeći tracert naredbom	11
Slika 18: instalacija DFS uloge na SERVER1 i SERVER2	12
Slika 19: konfiguracija DFS replikacijske grupe	12
Slika 20: konfiguracija "Share Replicated" foldera	13
Slika 21: uspješno konfiguirirana replikacija.....	13
Slika 22: testiranje pristupa podataka sa putanje \\janach.local\Public\REPO (DC i S1)	14
Slika 23: testiranje pristupa podataka sa putanje \\janach.local\Public\REPO (S2 i CLI)	14
Slika 24: testni pristup podataka sa putanje \\janach.local\Public\REPO	15
Slika 25: na site1 strani odgovoran je SERVER1	15
Slika 26: na site2 stranice odgovoran je SERVER2	16
Slika 27: prikaz DHCP i IPAM uloge na SERVER1 računalu	17
Slika 28: prikaz uspješne konfiguracije	17
Slika 29: uspješno kreiran "Scope".....	18
Slika 30: prijenost konfiguracije na DHCP SERVER2 računalo.....	18
Slika 31: CLI računalu uspješno je dodijeljena IP adresa DHCP-om	19
Slika 32: prikaz dodanih 30 "Computer" objekata u AD Users and Computers.....	19
Slika 33: prikaz dodanih 30 "Computer" objekata.....	20
Slika 34: Test NSlookup naredbom sa SERVER1 i CLI računala	20

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