

# Configurar o recurso IP SLA com L3out para rastrear a rota estática

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## Introduction

Este documento descreve como configurar o IPSLA (Internet Protocol Service Level Agreement, Contrato de Nível de Serviço de Protocolo de Internet) na Cisco Application Centric Infrastructure (ACI) para rastrear a rota estática aprendida de uma L3out e anuncie a outra L3out somente se a sub-rede estiver acessível a partir da primeira L3out.

## Prerequisites

### Requirements

A Cisco recomenda que você tenha conhecimento destes tópicos:

- Software ACI versão 4.1 e posterior
- L3out em direção ao dispositivo externo ou servidor
- Chassi EX e -FX
- Rastrear a rota para usar o Internet Control Message Protocol (ICMP) e as sondas TCP (neste exemplo, a sonda ICMP é usada)

**Observação:** o SLA IP da imagem da ACI é compatível com todos os switches de segunda geração Cisco Nexus, que incluem chassis -EX e -FX. Leia [Diretrizes e limitações para o SLA IP](#).

## Componentes Utilizados

As informações neste documento são baseadas nestas versões de software e hardware:

- ACI versão 5.2(2f)

- N9K-C93180YC-FX

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. Se a rede estiver ativa, certifique-se de que você entenda o impacto potencial de qualquer comando.

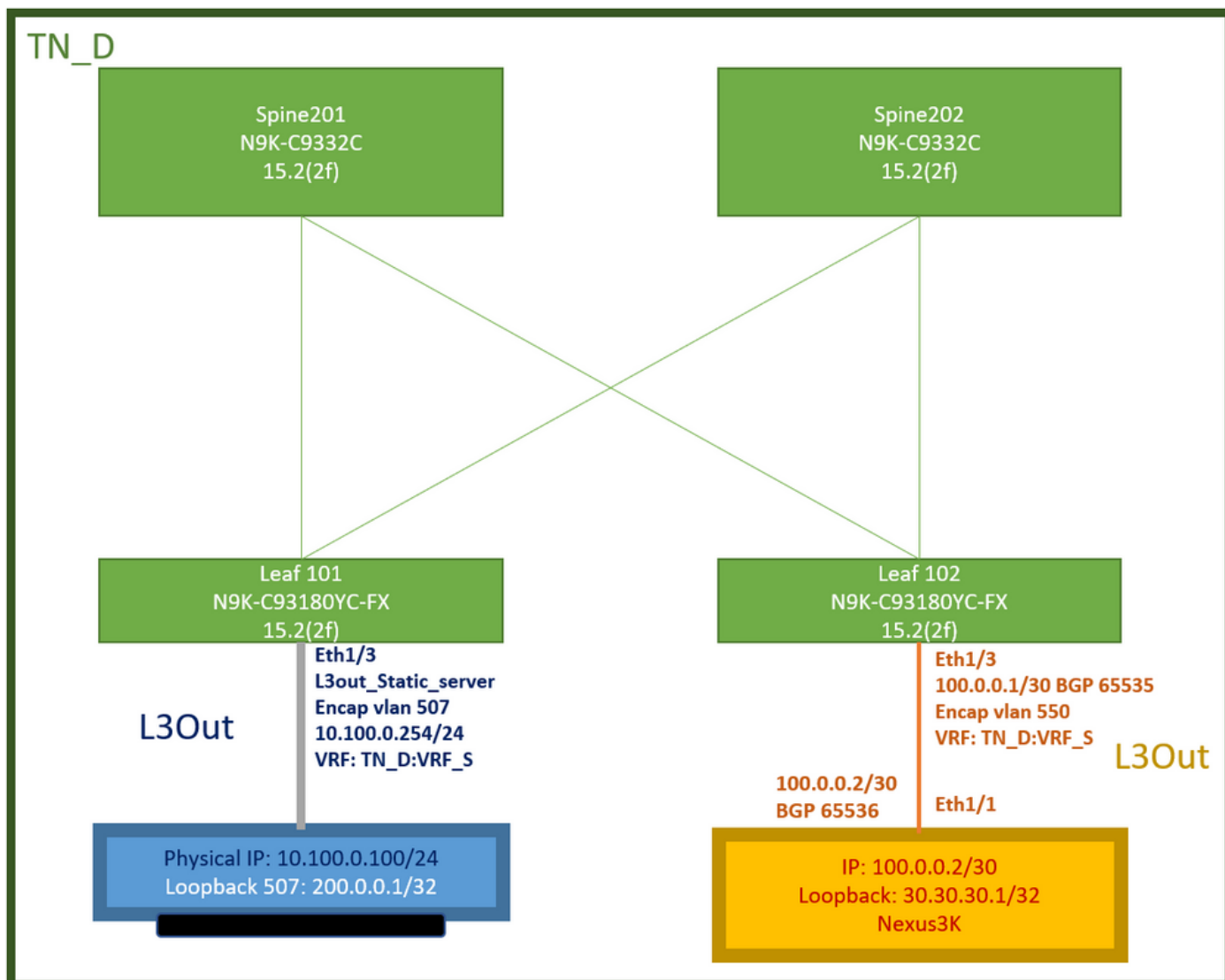
## Informações de Apoio

Alguns servidores têm várias interfaces (como um loopback) que podem ser alcançadas pela ACI por meio do endereço IP físico do servidor. Nesse caso, você pode ter um requisito para adicionar uma rota estática e anunciar externamente, mas somente se o IP físico do servidor estiver acessível. Portanto, o recurso de rastreamento de IP SLA é uma configuração inevitável que só pode ser obtida através da configuração L3out em direção a esses servidores. Neste momento, os recursos de rastreamento IP SLA não são suportados para a [rota estática em um domínio de bridge](#). Neste documento, procuraremos exemplos de servidor e configurações de rota de trânsito que usam SLA IP.

## Configurar

- L3out em direção ao servidor e em direção aos dispositivos N3K.
- Configure o rastreamento IP SLA para o endereço IP físico do servidor.
- Configure a rota estática em L3out em direção ao servidor que usa a faixa IP SLA e anuncia de outra L3out em direção ao N3K.

## Diagrama de Rede



Topologia de laboratório da ACI

## Configurações

Etapas do resumo:

### [Políticas de estrutura da ACI:](#)

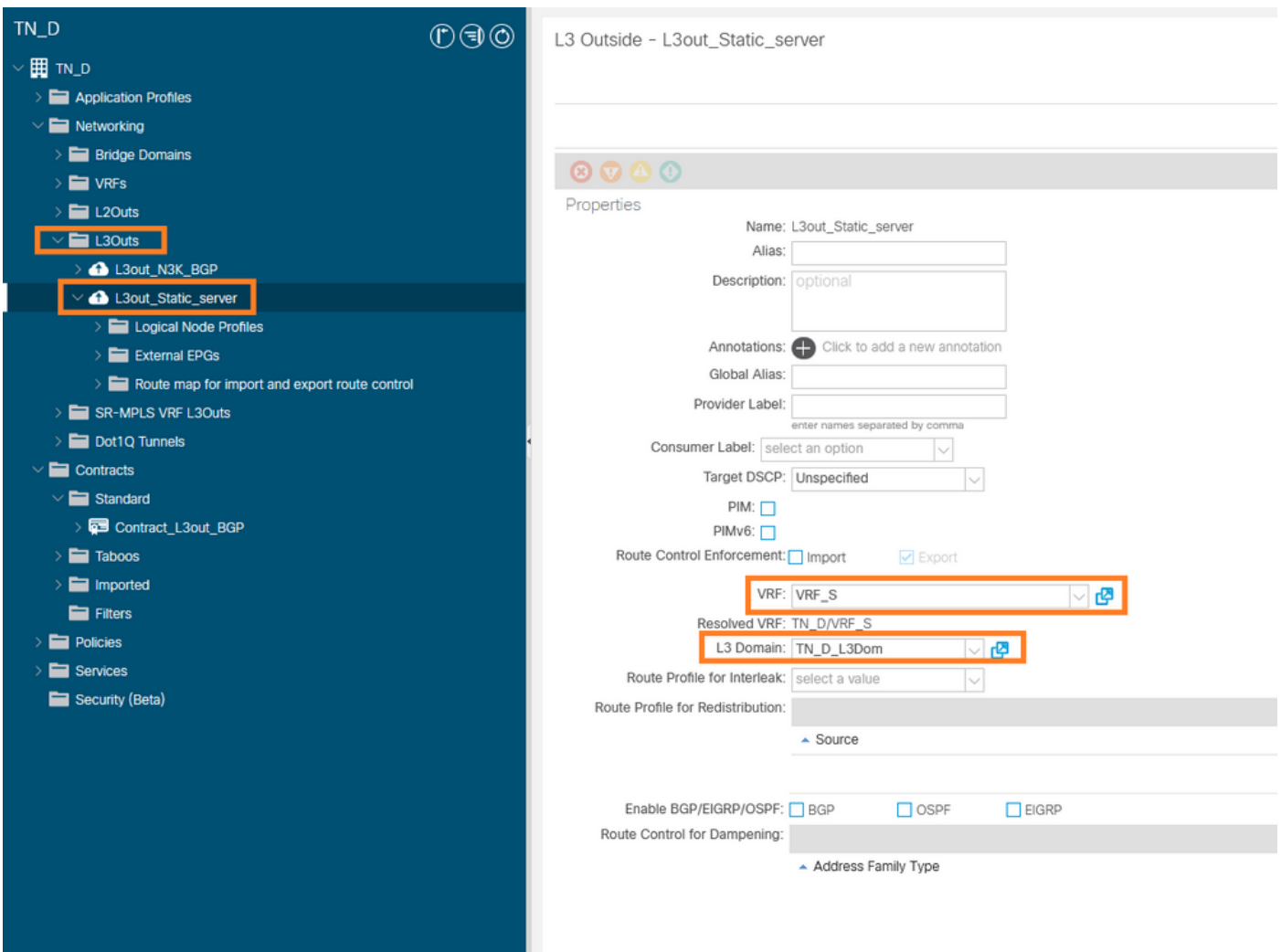
- Criar contrato (por exemplo, um filtro padrão comum que permite que todo o tráfego seja usado, mas você pode usar um filtro específico criado localmente no mesmo espaço para permitir tráfego específico. nesse caso, certifique-se de permitir o protocolo usado para o rastreamento IP SLA).
- Crie uma nova L3out para o servidor 10.100.0.100/24 (SVI 550 do lado da ACI com endereço IP 10.100.0.254)
- Criar políticas de rastreamento de SLA IP (política de monitoramento de SLA IP, política de membros de rastreamento, política de lista de rastreamento)
- Adicione a rota estática em L3out em direção ao servidor com lista de rastreamento de SLA IP.
- Crie uma nova L3out para o dispositivo N3K que usa o BGP. (EBGP) ACI AS 65535 e N3K AS 65536
- Exportar rota estática de L3out para N3K.
- Verifique a configuração e a acessibilidade.

1. Create Contract (para este exemplo, use um filtro padrão comum que permita todo o tráfego; entretanto, você pode usar um filtro específico criado localmente no mesmo espaço para permitir tráfego específico, mas, nesse caso, certifique-se de permitir o protocolo usado para o rastreamento IP SLA).



Criar contrato

2. Crie uma nova L3out para o servidor 10.100.0.100/24 (SVI 550 do lado da ACI com endereço IP 10.100.0.254).



Criar L3out

Logical Node Profile - L3out\_Static\_server\_nodeProfile

Properties

Name: L3out\_Static\_server\_nodeProfile

Description: optional

Alias:

Target DSCP: Unspecified

Node ID	Router ID	Loopback Address
topology/pod-1/node-101	101.101.101.101	101.101.101.101

Create BGP Protocol Profile:

Create BFD Multihop Protocol Profile:

Anexando nó ao L3out

Logical Interface Profile - L3out\_Static\_server\_interfaceProfile

Policy

General Routed Sub-Interfaces Routed Interfaces SVI Floating SVI

Path	Side A IP	Side B IP	Secondary IP Address	IP Address	MAC Address	MTU (bytes)	Encap	Encap Scope
Pod-1/Node-101/eth1/3				10.100.0.254/24	00:22:BD:FB:19:FF	inherit	vlan-507	Local

Conectando a interface ao L3out

External EPG - EXT\_static\_EPG

Policy

General Contracts Inherited Contracts Subject Labels EPG Labels

Properties

Name: EXT\_static\_EPG

Annotations: Click to add a new annotation

Global Alias:

Description: optional

pcTag: 32771

Contract Exception Tag:

Configured VRF Name: VRF\_S

Resolved VRF: un/tn-TN\_D/ctx-VRF\_S

QoS Class: Unspecified

Target DSCP: Unspecified

Configuration Status: applied

Configuration Issues:

Preferred Group Member: Exclude Include

Intra-Ext-EPG Isolation: Enforced Unenforced

IP Address	Scope	Name	Aggregate	Route Control Profile	Route Summarization Policy
0.0.0.0/0		External Subnets for the Extern...			

Show Usage Reset Subnet

Configurar EPG externo

External EPG - EXT\_static\_EPG

Policy

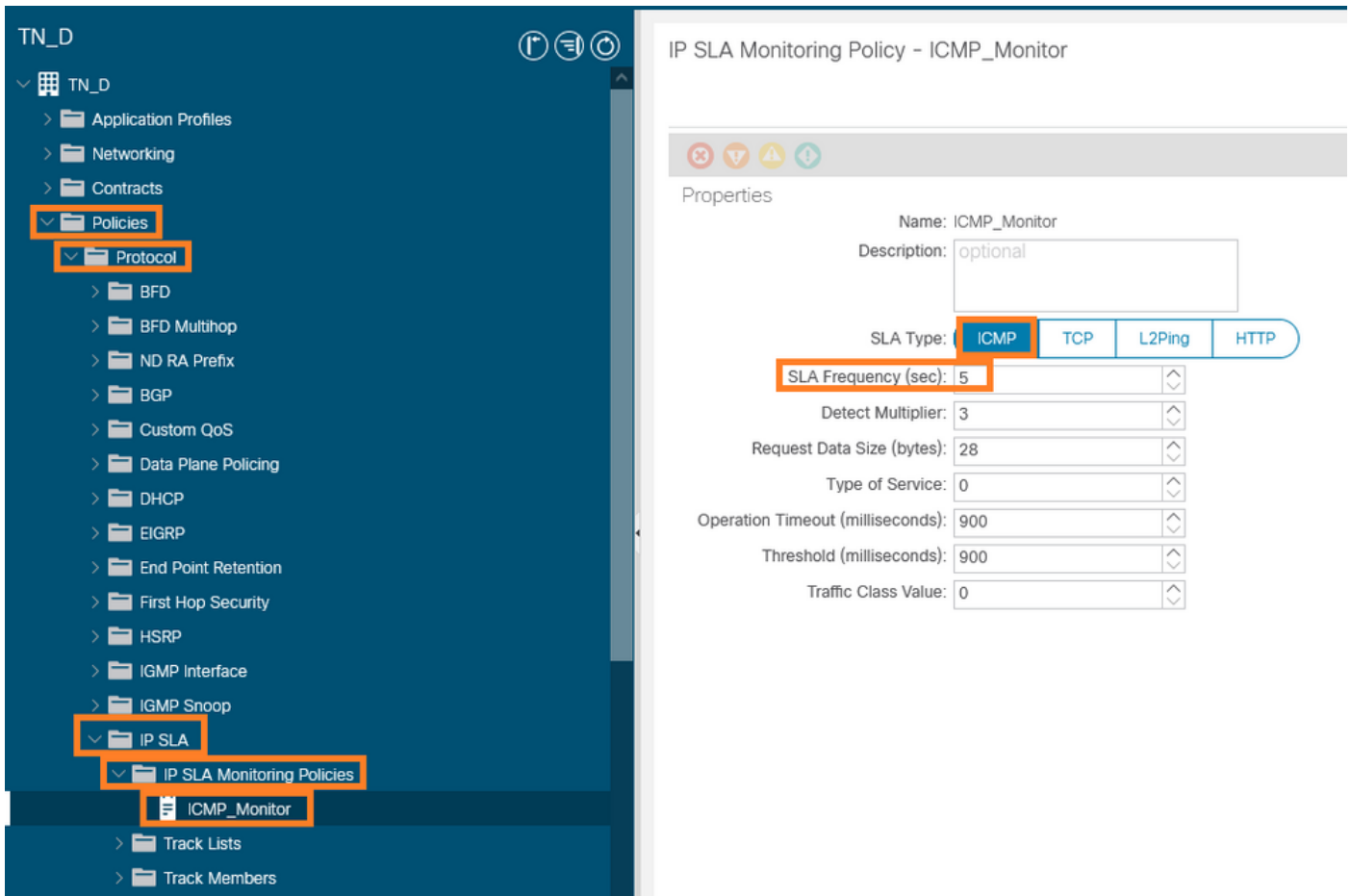
General Contracts Inherited Contracts Subject Labels EPG Labels

Name	Tenant	Tenant Alias	Contract Type	Provided / Consumed	QoS Class	State	Label	Subject Label
Contract Type: Contract								
Contract_L3out_BGP	TN_D		Contract	Provided	Unspecified	formed		

Anexando contrato à L3out

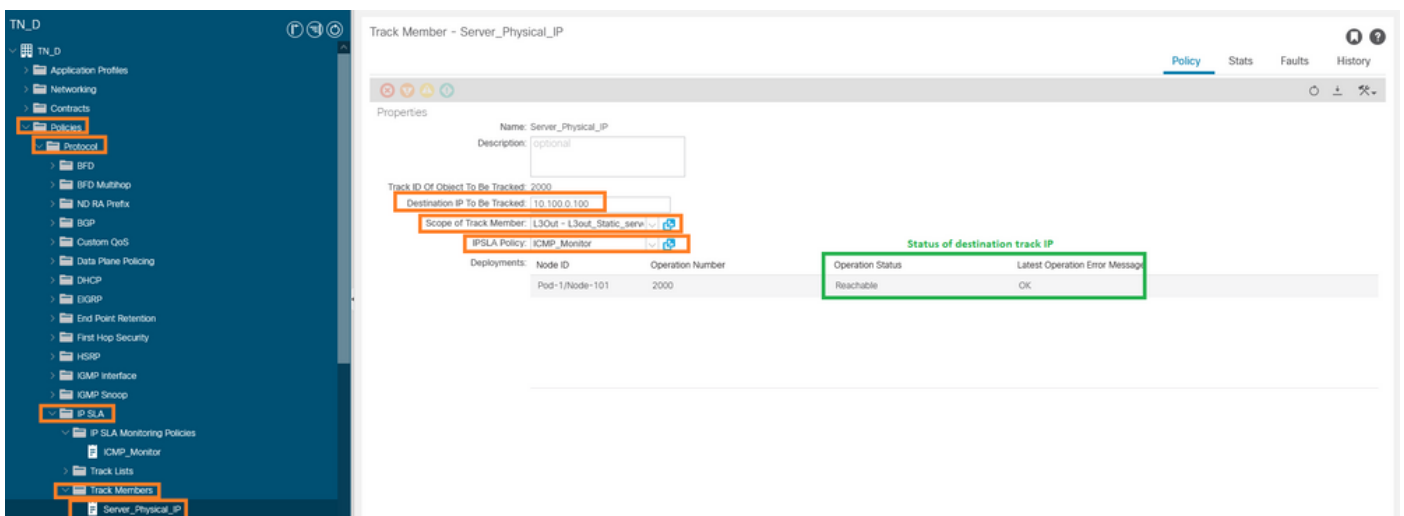
3. Criar políticas de rastreamento de SLA IP (política de monitoramento de SLA IP, política de membros de rastreamento, política de lista de rastreamento).

Política de monitor de SLA IP:



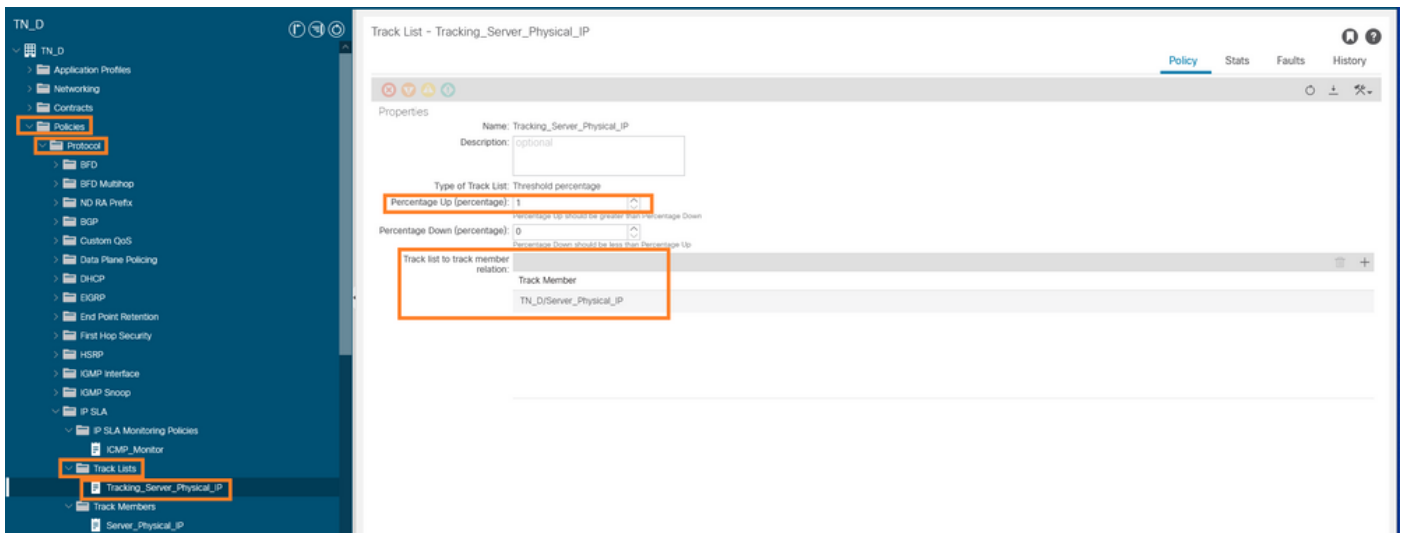
Configurar política de monitoramento de SLA IP

Membros do rastreamento IP SLA:



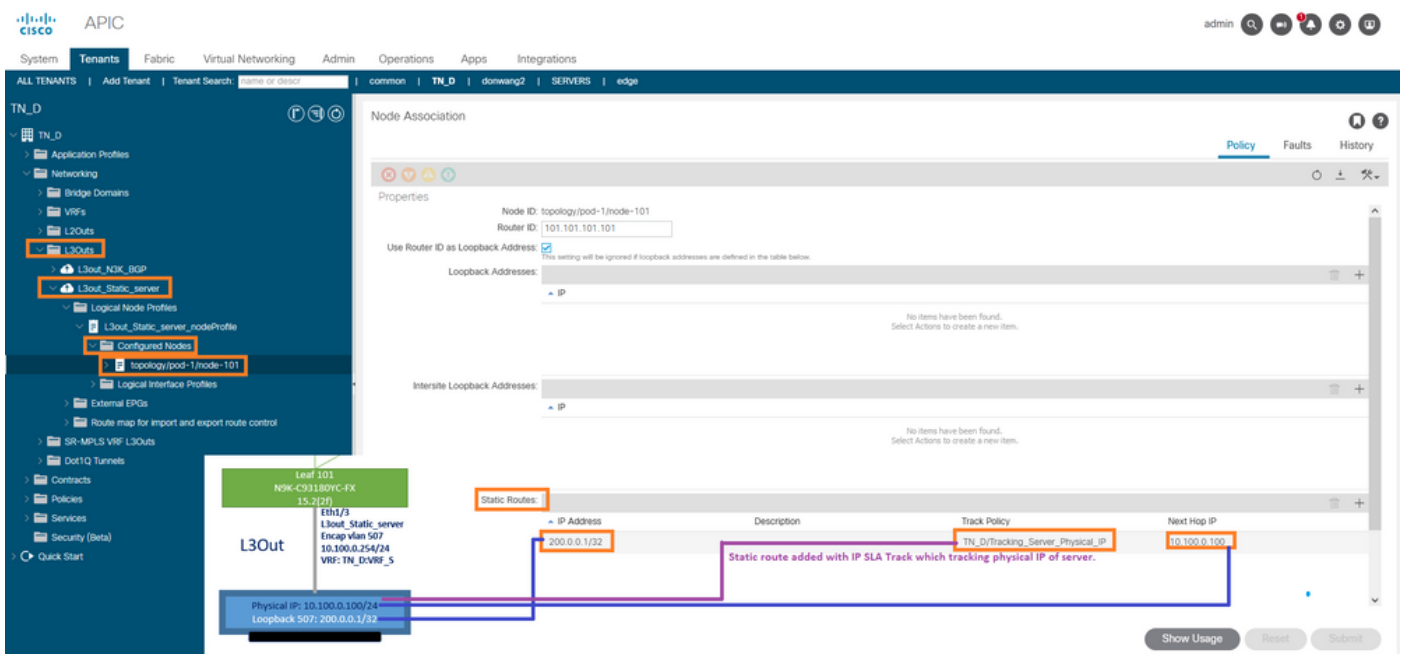
Adição de IP para monitorar a política

Política da lista de controle:



Configurar lista de controle

4. Configure a rota estática em L3out em direção ao servidor com a política de lista de rastreamento SLA IP recém-criada.



Configurar rota estática em L3out

5. Crie uma nova L3out para o dispositivo N3K que usa o Border Gateway Protocol (BGP). (EBGP) ACI AS 65535 e N3K AS 65536.

**TN\_D**

- Application Profiles
- Networking
  - Bridge Domains
  - VRFs
  - L2Outs
  - L3Outs**
    - L3out\_N3K\_BGP**
      - Logical Node Profiles
        - L3out\_BGP\_nodeProfile
          - Configured Nodes
          - Logical Interface Profiles
            - L3out\_N3K\_BGP\_interfaceProfile
              - BGP Peer 100.0.0.2 - Node-102/1/3

**L3 Outside - L3out\_N3K\_BGP**

Properties

Name: L3out\_N3K\_BGP

Alias:

Description: optional

Annotations: + Click to add a new annotation

Global Alias:

Provider Label:

Consumer Label:

Target DSCP: Unspecified

PIM:

PIMv6:

Route Control Enforcement:  Import  Export

VRF: VRF\_S

Resolved VRF: TN\_D/VRF\_S

L3 Domain: TN\_D L3Dom

Route Profile for Interleak:

Route Profile for Redistribution:

Enable BGP/EIGRP/OSPF:  BGP  OSPF  EIGRP

Route Control for Dampening:

Address Family Type:

## Configurar o protocolo BGP

**TN\_D**

- Application Profiles
- Networking
  - Bridge Domains
  - VRFs
  - L2Outs
  - L3Outs**
    - L3out\_N3K\_BGP**
      - Logical Node Profiles
        - L3out\_BGP\_nodeProfile**
          - Configured Nodes
          - Logical Interface Profiles
            - L3out\_N3K\_BGP\_interfaceProfile
              - BGP Peer 100.0.0.2 - Node-102/1/3

**Logical Node Profile - L3out\_BGP\_nodeProfile**

Properties

Name: L3out\_BGP\_nodeProfile

Description: optional

Alias:

Target DSCP: Unspecified

Nodes:

Node ID	Node ID	Loopback Address
topology/S0/0-102	102.102.102.102	102.102.102.102

BGP Peer Connectivity:

Peer IP Address	Peer Controls	Interface
100.0.0.2		Pod-1/Node-102/1/3

Create BGP Protocol Profile:

Create EFD Multihop Protocol Profile:

## Perfil de peer do BGP



**BGP Peer Connectivity Profile 100.0.0.2- Node-102/1/3**

Properties

Address: 100.0.0.2

Description: optional

BGP Controls:

- Allow Self AS
- AS override
- Disable Peer AS Check
- Next-hop Self
- Send Community
- Send Extended Community
- Send Domain Path

Password:

Confirm Password:

Allowed Self AS Count: 3

Peer Controls:

- Bidirectional Forwarding Detection
- Disable Connected Check

Address Type Controls:

- AF Mcast
- AF Ucast

Routing Domain ID:

EBGP Multihop TTL: 3

Weight for routes from this neighbor: 0

Private AS Control:

- Remove all private AS
- Remove private AS
- Replace private AS with local AS

BGP Peer Prefix Policy: select a value

Pre-existing BGP session must be reset to apply the Prefix policy

Site of Origin:

e.g. extended:as2-nn2:1000:65534  
e.g. extended:ipv4-nn2:1.2.3.4:65515  
e.g. extended:as4-nn2:1000:65505  
e.g. extended:as2-nn4:1000:6554387

Remote Autonomous System Number: 65536

Local-AS Number Config:

Local-AS Number:

This value must not match the MP-BGP RR policy

Admin State:  Disabled  Enabled

Route Control Profile:

Name

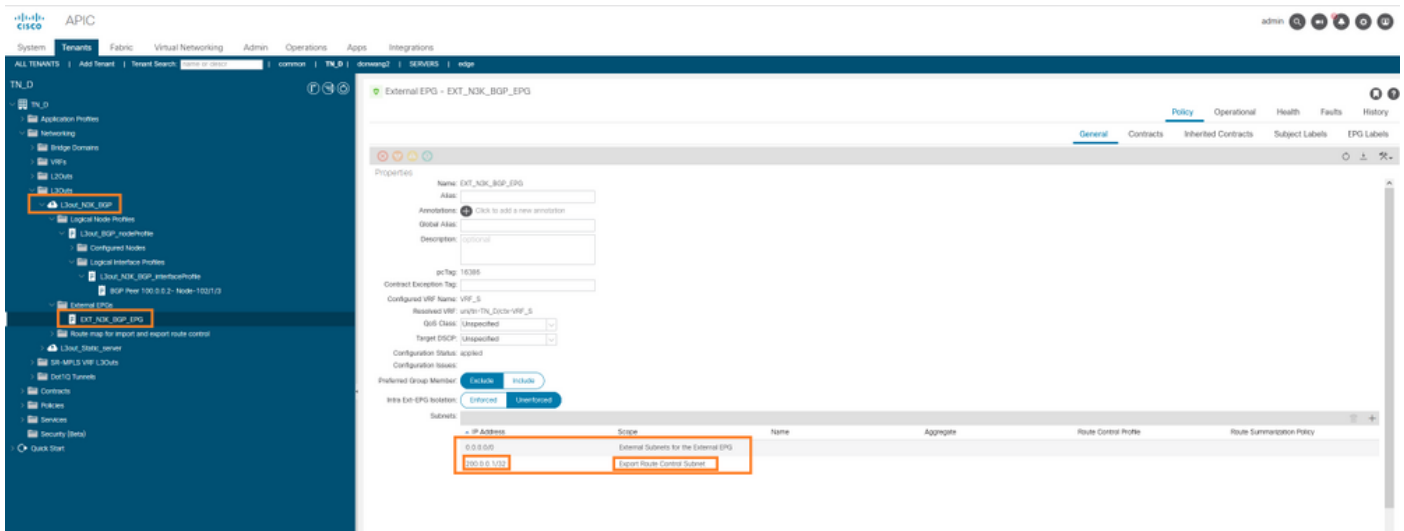
Configurar política de peer BGP

Logical Interface Profile - L3out\_N3K\_BGP\_interfaceProfile

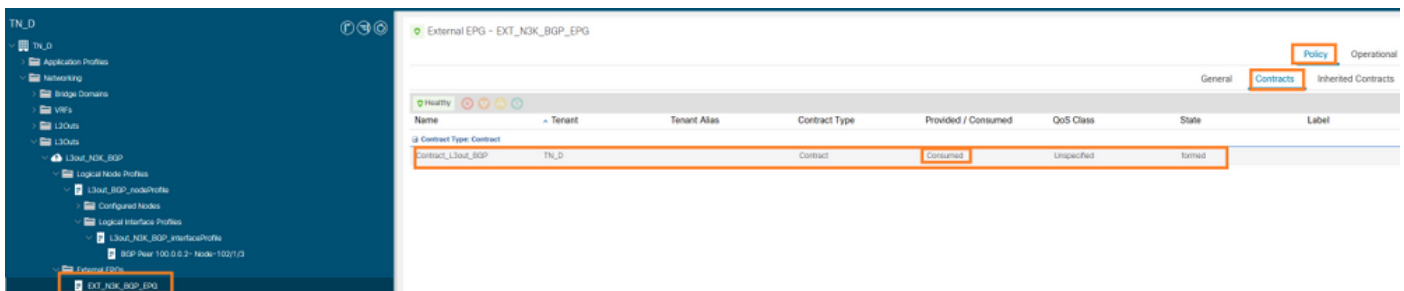
Policy

Path	Side A IP	Side B IP	Secondary IP Address	IP Address	MAC Address	MTU (bytes)	Encap	Encap Scope
node-102/1/3				100.0.0.100	00:22:80:F8:19:0F	inherit	vlan-500	Local

Configurar o perfil da interface lógica em L3out



Sub-rede de exportação EPG externa em trânsito na L3out



Anexando contrato ao EPG externo

## 6. Exportar rota estática de L3out para N3K.

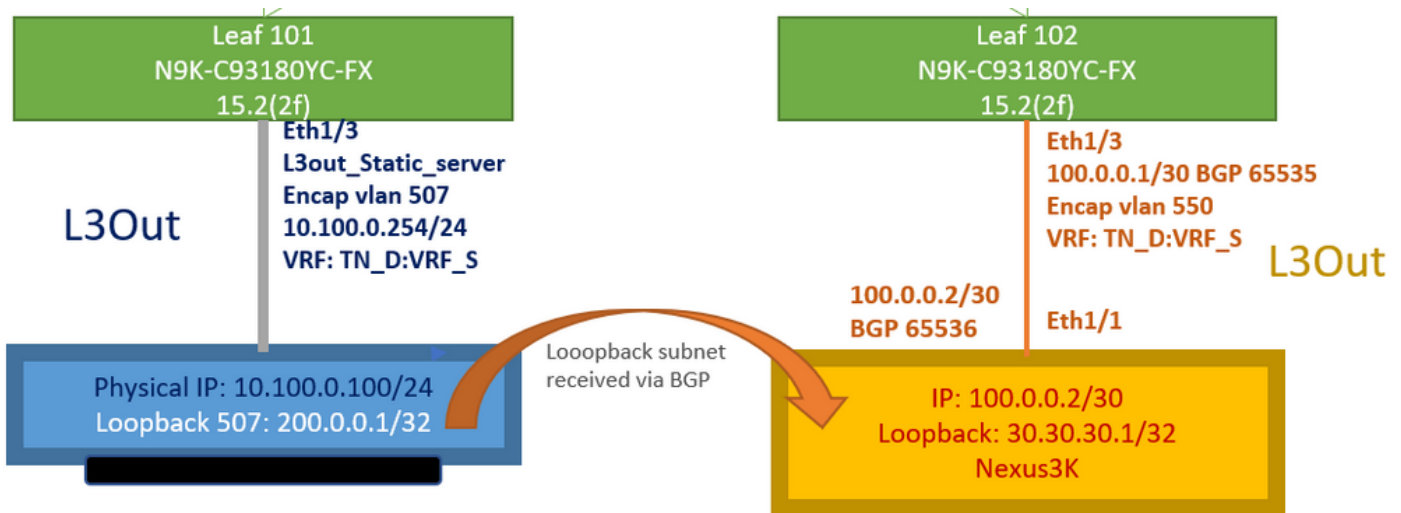
```

switchname N3K
feature bgp
feature interface-vlan
interface Vlan550
  no shutdown
  vrf member BGP_L3out
  ip address 100.0.0.2/30
interface loopback200
  vrf member BGP_L3out
  ip address 30.30.30.1/32
interface Ethernet1/1
  switchport mode trunk
router bgp 65536
  address-family ipv4 unicast
  neighbor 100.0.0.1
  vrf BGP_L3out
  router-id 3.3.3.3
  address-family ipv4 unicast
  network 30.30.30.1/32
  neighbor 100.0.0.1
  remote-as 65535
  update-source Vlan550
  address-family ipv4 unicast
  
```

## Verificar

Use esta seção para confirmar se a sua configuração funciona corretamente.

## Nexus3K.



## Anúncio de rota de trânsito explicado pela topologia

```
N3K# routing vrf BGP_L3out
```

```
N3K%BGP_L3out# show ip route IP Route Table for VRF "BGP_L3out" '*' denotes best ucast next-hop
'***' denotes best mcast next-hop '[x/y]' denotes [preference/metric] '%' in via output denotes
VRF 30.30.30.1/32, ubest/mbest: 2/0, attached *via 30.30.30.1, Lo200, [0/0], 02:35:27, local
*via 30.30.30.1, Lo200, [0/0], 02:35:27, direct 100.0.0.0/30, ubest/mbest: 1/0, attached *via
100.0.0.2, Vlan550, [0/0], 05:52:18, direct 100.0.0.2/32, ubest/mbest: 1/0, attached *via
100.0.0.2, Vlan550, [0/0], 05:52:18, local 200.0.0.1/32, ubest/mbest: 1/0 *via 100.0.0.1,
[20/0], 02:32:36, bgp-65536, external, tag 65535
```

O Loopback do Servidor pode ser alcançado com a origem como endereço de loopback N3K.

```
N3K
```

```
interface loopback200
  vrf member BGP_L3out
  ip address 30.30.30.1/32
```

```
N3K# ping 200.0.0.1 vrf BGP_L3out source 30.30.30.1
```

```
PING 200.0.0.1 (200.0.0.1): 56 data bytes
64 bytes from 200.0.0.1: icmp_seq=0 ttl=252 time=0.94 ms
64 bytes from 200.0.0.1: icmp_seq=1 ttl=252 time=0.729 ms
64 bytes from 200.0.0.1: icmp_seq=2 ttl=252 time=0.658 ms
64 bytes from 200.0.0.1: icmp_seq=3 ttl=252 time=0.706 ms
64 bytes from 200.0.0.1: icmp_seq=4 ttl=252 time=0.655 ms
--- 200.0.0.1 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.655/0.737/0.94 ms
```

## Tabela de rotas ACI Leaf 102 (que tem L3out em direção ao Nexus 3K).

```
Leaf102# show ip route vrf TN_D:VRF_S
```

```
IP Route Table for VRF "TN_D:VRF_S"
'*' denotes best ucast next-hop
'***' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%' in via output denotes VRF
10.100.0.0/24, ubest/mbest: 1/0
    *via 10.0.96.64%overlay-1, [200/0], 02:56:36, bgp-65535, internal, tag 65535
30.30.30.1/32, ubest/mbest: 1/0
```

<<address

of N3K.

```
*via 100.0.0.2%TN_D:VRF_S, [20/0], 02:44:34, bgp-65535, external, tag 65536
100.0.0.0/30, ubest/mbest: 1/0, attached, direct
  *via 100.0.0.1, vlan19, [0/0], 05:09:37, direct
100.0.0.1/32, ubest/mbest: 1/0, attached
  *via 100.0.0.1, vlan19, [0/0], 05:09:37, local, local
101.101.101.101/32, ubest/mbest: 1/0
  *via 10.0.96.64%overlay-1, [1/0], 02:56:36, bgp-65535, internal, tag 65535
102.102.102.102/32, ubest/mbest: 2/0, attached, direct
  *via 102.102.102.102, lo5, [0/0], 16:49:13, local, local
  *via 102.102.102.102, lo5, [0/0], 16:49:13, direct
200.0.0.1/32, ubest/mbest: 1/0
  *via 10.0.96.64%overlay-1, [1/0], 02:42:15, bgp-65535, internal, tag 65535
```

## Verificação da configuração do SLA IP Leaf 101 da CLI.

### Leaf101# show ip sla configuration

```
IP SLAs Infrastructure Engine-III
Entry number: 2000
Owner: owner-icmp-echo-dme
Tag:
Operation timeout (milliseconds): 900
Type of operation to perform: icmp-echo
Target address/Source address: 10.100.0.100/0.0.0.0
Traffic-Class parameter: 0x0
Type Of Service parameter: 0x0
Request size (ARR data portion): 28
Verify data: No
Vrf Name: TN_D:VRF_S
Schedule:
  Operation frequency (seconds): 5 (not considered if randomly scheduled)
  Next Scheduled Start Time: Start Time already passed
  Group Scheduled : FALSE
  Randomly Scheduled : FALSE
  Life (seconds): Forever
  Entry Ageout (seconds): 3600
  Recurring (Starting Everyday): FALSE
  Status of entry (SNMP RowStatus): Active
Threshold (milliseconds): 900
Distribution Statistics:
  Number of statistic hours kept: 2
  Number of statistic distribution buckets kept: 1
  Statistic distribution interval (milliseconds): 20
History Statistics:
  Number of history Lives kept: 0
  Number of history Buckets kept: 15
  History Filter Type: None
```

### Leaf101# show track brief

TrackId	Type	Instance	Parameter	State	Last Change
4	IP SLA	2000	reachability	up	2021-09-16T18:08:42.364+00:00
3	List	---	percentage	up	2021-09-16T18:08:42.365+00:00

### Leaf101# show track

```
Track 1
  List Threshold percentage
  Threshold percentage is up
  6 changes, last change 2021-09-16T00:01:50.339+00:00
  Threshold percentage up 1% down 0%
  Tracked List Members:
    Object 2 (100)% up
  Attached to:
```

```
Route prefix 200.0.0.1/32
Track 2
  IP SLA 2000
  reachability is up
  6 changes, last change 2021-09-16T00:01:50.338+00:00
  Tracked by:
    Track List 1
```

## Verificação com o comando Managed Object Query (Moquery):

```
apic1# moquery -c fvIPSLAMonitoringPol -f 'fv.IPSLAMonitoringPol.name=="ICMP_Monitor"'
Total Objects shown: 1
```

```
# fv.IPSLAMonitoringPol
name          : ICMP_Monitor
annotation    :
childAction   :
descr         :
dn            : uni/tn-TN_D/ipslaMonitoringPol-ICMP_Monitor
extMngdBy     :
httpMethod    : get
httpUri       : /
httpVersion   : HTTP10
ipv4Tos       : 0
ipv6TrfClass  : 0
lcOwn         : local
modTs         : 2021-09-15T21:18:48.195+00:00
monPolDn      : uni/tn-common/monepg-default
nameAlias     :
ownerKey      :
ownerTag      :
reqDataSize   : 28
rn            : ipslaMonitoringPol-ICMP_Monitor
slaDetectMultiplier : 3
slaFrequency  : 5
slaPort       : 0
slaType       : icmp
status        :
threshold     : 900
timeout       : 900
uid           : 15374
userdom       : :all:
```

```
apic1# moquery -c fvTrackMember -f 'fv.TrackMember.name=="Server_Physical_IP"'
Total Objects shown: 1
```

```
# fv.TrackMember
name          : Server_Physical_IP
annotation    :
childAction   :
descr         :
dn            : uni/tn-TN_D/trackmember-Server_Physical_IP
dstIpAddr     : 10.100.0.100
extMngdBy     :
id            : 2000
lcOwn         : local
modTs         : 2021-09-15T21:16:22.992+00:00
monPolDn      : uni/tn-common/monepg-default
nameAlias     :
ownerKey      :
ownerTag      :
```

```
rn          : trackmember-Server_Physical_IP
scopeDn     : uni/tn-TN_D/out-L3out_Static_server
status      :
uid         : 15374
userdom     : :all:
```

```
apic1# moquery -c fvTrackList -f 'fv.TrackList.name=="Tracking_Server_Physical_IP"'
```

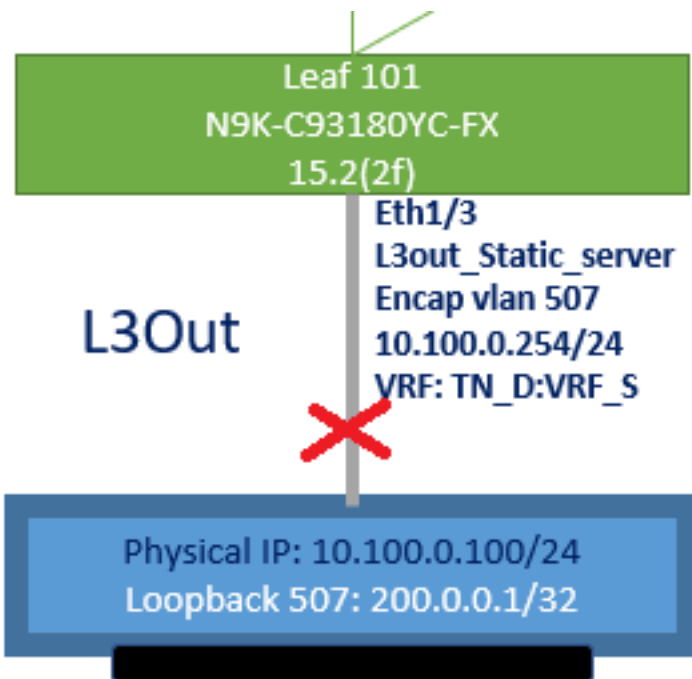
```
Total Objects shown: 1
```

```
# fv.TrackList
name        : Tracking_Server_Physical_IP
annotation  :
childAction :
descr       :
dn          : uni/tn-TN_D/tracklist-Tracking_Server_Physical_IP
extMngdBy   :
lcOwn       : local
modTs       : 2021-09-15T07:41:15.958+00:00
monPolDn    : uni/tn-common/monepg-default
nameAlias   :
ownerKey    :
ownerTag    :
percentageDown : 0
percentageUp : 1
rn          : tracklist-Tracking_Server_Physical_IP
status      :
type        : percentage
uid         : 15374
userdom     : :all:
weightDown  : 0
weightUp    : 1
```

## Troubleshoot

Atualmente, não existem informações disponíveis específicas sobre Troubleshooting para esta configuração.

No caso de a desconexão do link ou o endereço IP físico não poder ser alcançado, o SLA IP da ACI mostra o IP de destino como 'timeout' após o limite configurado chegar.



Interface L3out inativa

Track Member - Server\_Physical\_IP

Properties

Name: Server\_Physical\_IP  
Description: optional

Track ID Of Object To Be Tracked: 2000  
Destination IP To Be Tracked: 10.100.0.100

Scope of Track Member: L3Out - L3out\_Static\_serve

IPSLA Policy: ICMP\_Monitor

Deployments:

Node ID	Operation Number	Operation Status	Latest Operation Error Message
Pod-1/Node-101	2000 ms (2seconds)	Unreachable	Timeout

Status do link do monitor SLA IP após o link inativo

Verificação CLI Leaf 101 (Você pode ver o tempo limite para "código de retorno da última operação").

```
Leaf101# show ip sla statistics
IPSLAs Latest Operation Statistics
IPSLA operation id: 2000
    Latest RTT: NoConnection/Busy/Timeout
Latest operation start time: 23:54:30 UTC Wed Sep 15 2021
Latest operation return code: Timeout
Number of successes: 658
Number of failures: 61
Operation time to live: forever
```

Assim que o servidor estiver acessível, ele mostrará o status OK.

The screenshot displays the Cisco APIC configuration page for a Track Member named 'Server\_Physical\_IP'. The left sidebar shows the navigation tree with 'Server\_Physical\_IP' selected under 'Track Members'. The main panel shows the configuration details:

- Name: Server\_Physical\_IP
- Description: optional
- Track ID Of Object To Be Tracked: 2000
- Destination IP To Be Tracked: 10.100.0.100
- Scope of Track Member: L3Out - L3out\_Static\_serv
- IPSLA Policy: ICMP\_Monitor

Below the configuration, a table shows the deployment status:

Node ID	Operation Number	Operation Status	Latest Operation Error Message
Pod-1/Node-101	2000	Reachable	OK

Status do monitor de SLA IP após o link ativado

```
Leaf101# show ip sla statistics
```

```
IPSLAs Latest Operation Statistics
```

```
IPSLA operation id: 2000
```

```
Latest RTT: 1 milliseconds
```

```
Latest operation start time: 00:03:15 UTC Thu Sep 16 2021
```

```
Latest operation return code: OK
```

```
Number of successes: 18
```

```
Number of failures: 86
```

```
Operation time to live: forever
```

## Informações Relacionadas

- [Guia de configuração de rede da camada 3 do Cisco APIC, versão 5.2\(x\)](#)
- [Suporte Técnico e Documentação - Cisco Systems](#)