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# 3 Steps to Gain Actionable Visibility in the Cisco SD-WAN Using ThousandEyes

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BRKENT-2126

# Agenda

- Use Cases
- Agent Deployment Options
- Steering Test Traffic
- Configuring Tests & Viewing Results

# Cisco Webex App

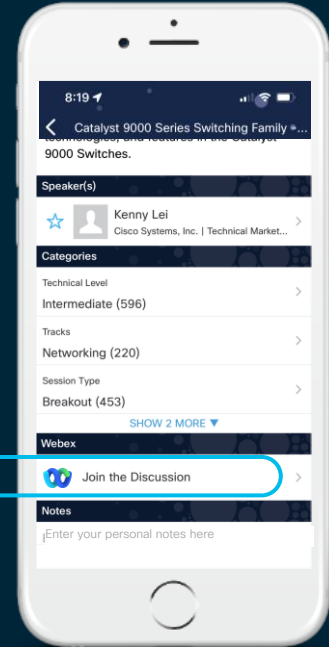
## Questions?

Use Cisco Webex App to chat with the speaker after the session

## How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 17, 2022.

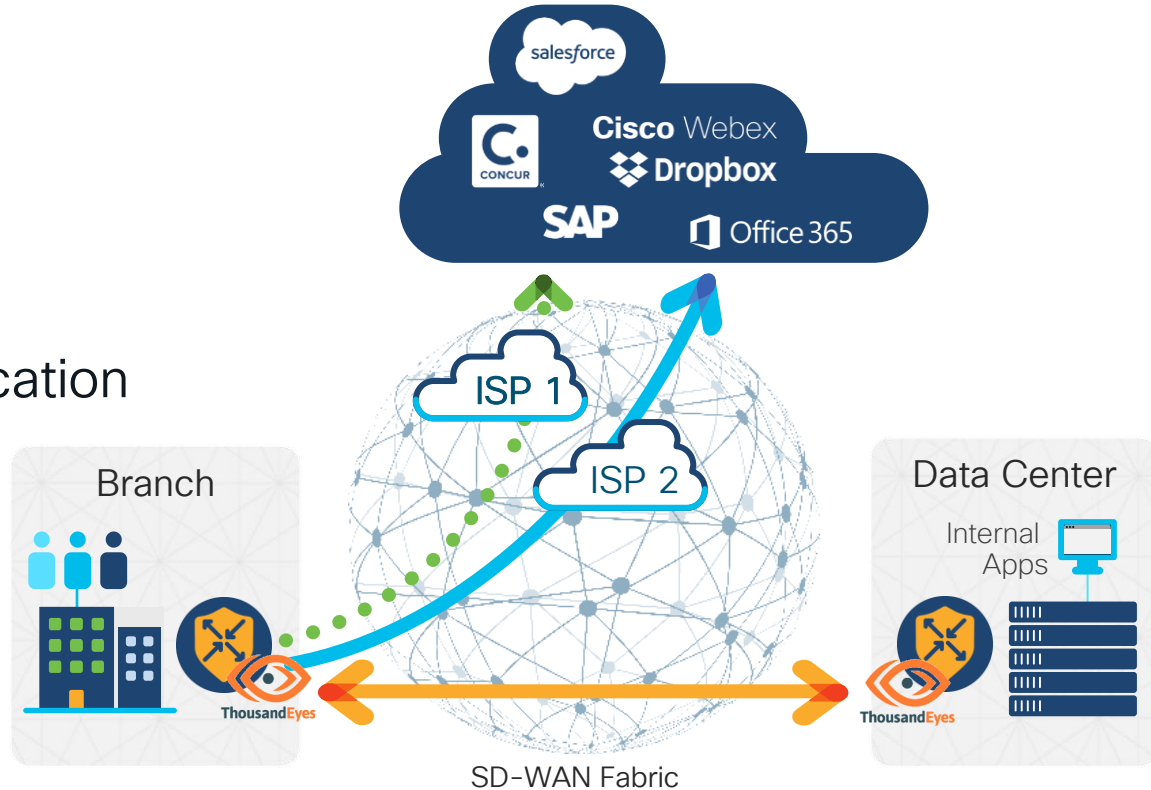


<https://ciscolive.ciscoevents.com/ciscolivebot/#BRKENT-2126>

# SD-WAN + ThousandEyes

# Use Cases

- SD-WAN Underlay
- SD-WAN Overlay
- Internal and SaaS Application

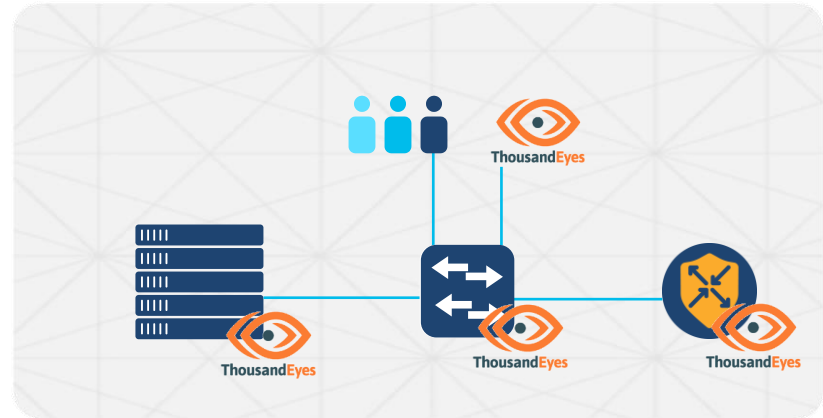


# First Step: Deploying Embedded Agents



# Different Agent Deployment Options

- Embedded on an SD-WAN Edge
- Embedded in a Catalyst 9000 switch
- Virtual machine
- Physical appliance

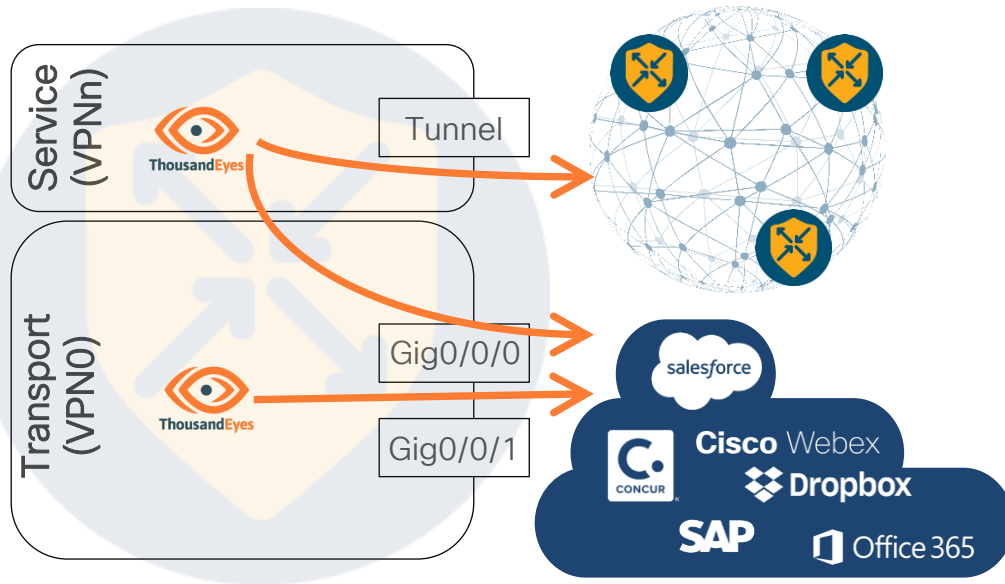




# Embedded Agent Requirements

Platform	HW Requirements	SW Requirements	BrowserBot	Management*
ASR 1001-X ASR 1002-X ASR 1006-X	Minimum 8G of RAM and Flash	IOS-XE 17.8.1+		vManage 20.8+
Catalyst 8500				
Catalyst 8300 Catalyst 8200(L)			Not Supported	
ISR44xx ISR43xx ISR42xx	Minimum 8G of RAM and Flash	IOS-XE 17.6.1+		vManage 20.6+
ISR 1100x-6G		IOS-XE 17.7.1+		
Catalyst 9300(L) Catalyst 9400	SSD module for BrowserBot tests	IOS-XE 17.6.1+ DNA Advantage	Supported with SSD module	DNA Center 2.2.2.3+

# Deployment Options



## Agent in VPN0:

- Basic setup (default)
- Still behind a NAT

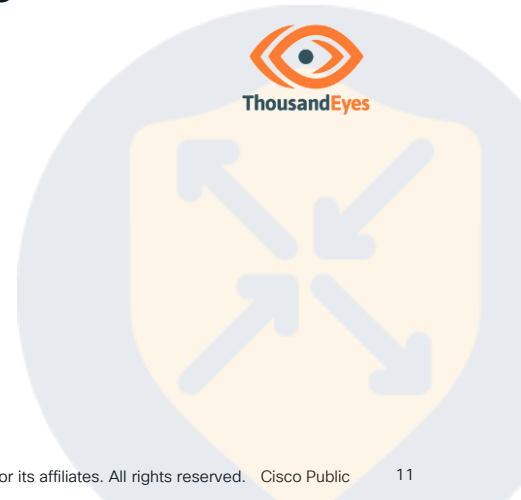
## Agent in Service VPN:

- Requires unique subnet
- Can monitor Overlay and Underlay paths
- Test traffic follows SD-WAN policies

- Agent requires Internet connectivity (proxies supported).
- Agent's traffic is always routed via a VPG interface.

# Deploying ThousandEyes Agent Using vManage

- Download Agent Software from ThousandEyes portal
- Copy Account Group Token
- Upload Agent Software to vManage
- Define ThousandEyes Feature Template in vManage
- Attach Feature Template to target device



# Downloading Agent Software

- Cloud & Enterprise Agents > Agent Settings > Add New Ent. Agent
- Cisco Application Hosting > Routers > Download – TAR
- Note down the value of the Account Group Token

**Add New Enterprise Agent**

Appliance Custom Appliance **Cisco Application Hosting** Linux Package Docker Cloud Templates

Account Group Token [Redacted] **Copy**

Catalyst Switches Nexus Switches **Routers**

**Cisco IOS XE Docker Appliance**

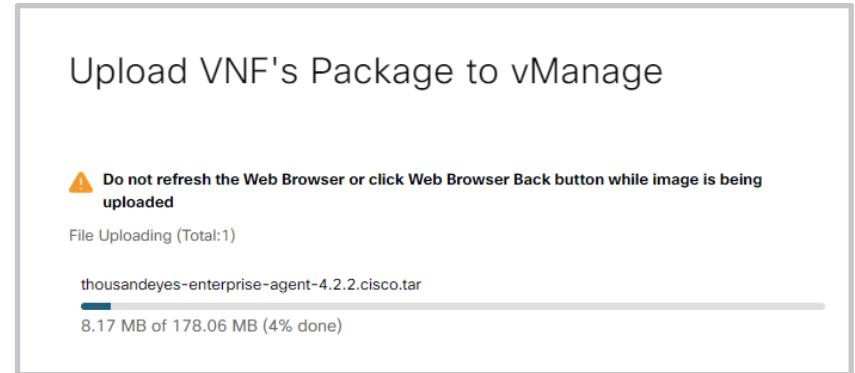
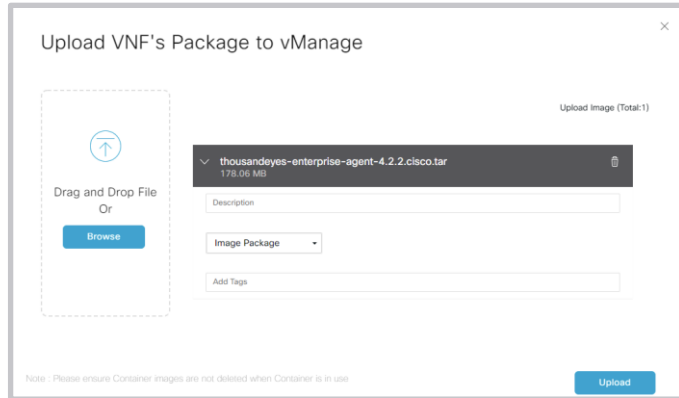
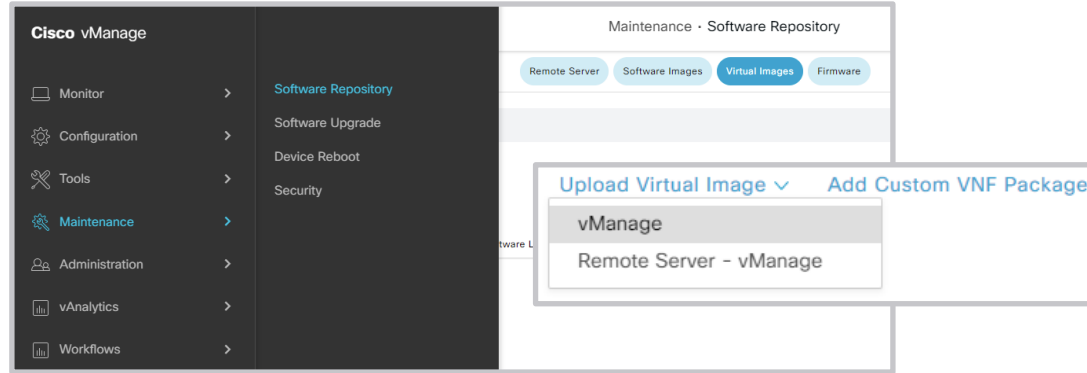
Catalyst 8000 Series Routers  
\* Browser tests are not currently supported. SSD not required.

Integrated Services Routers (ISR)  
\* Browser tests are not currently supported. SSD not required.

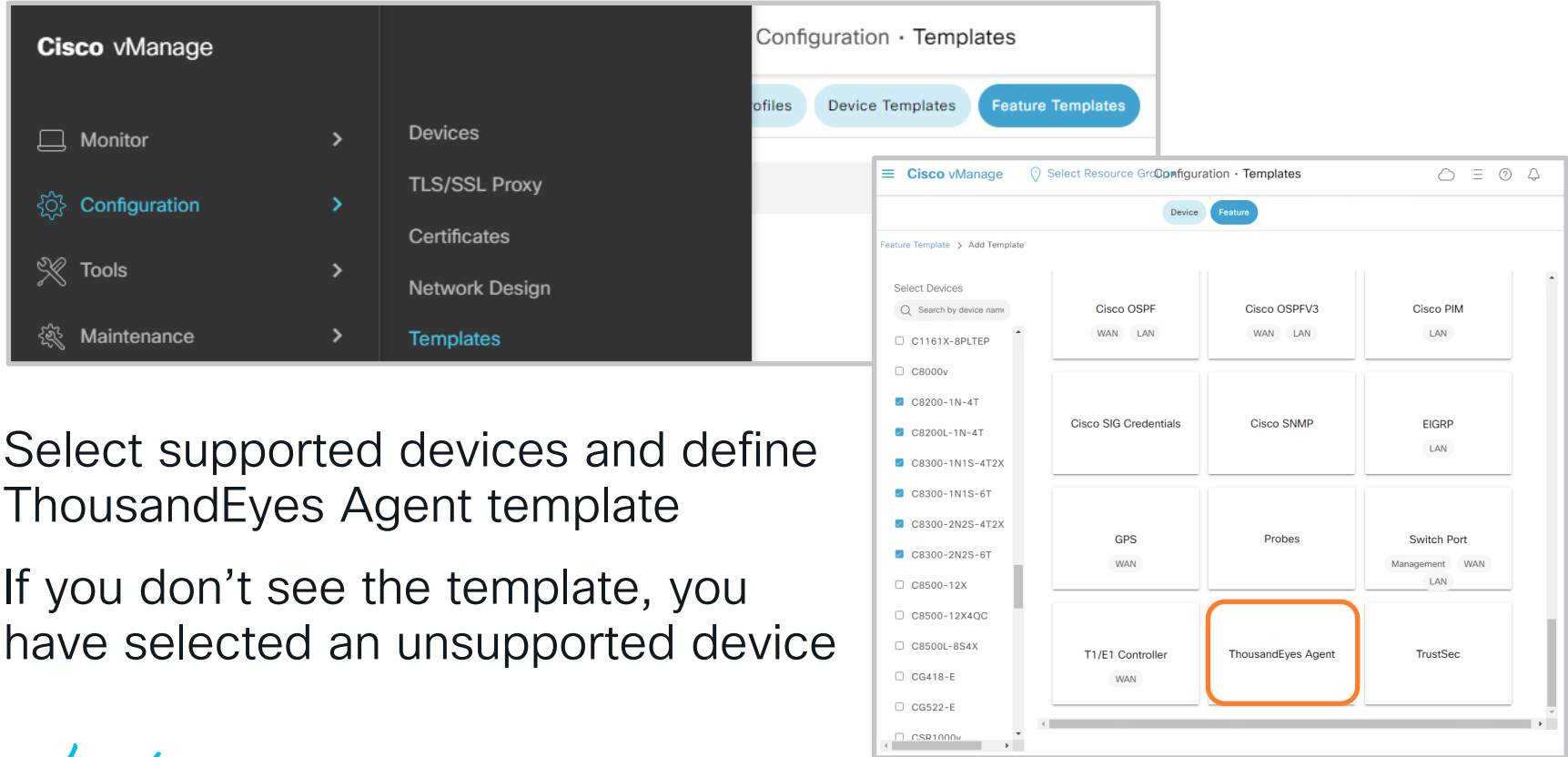
Aggregation Services Routers (ASR)  
\* Browser tests are not currently supported. SSD not required.

**Download - TAR**  
[Installation Guide](#)

# Uploading ThousandEyes Agent to vManage



# Defining ThousandEyes Feature Template



The screenshot shows the Cisco vManage interface. On the left is a dark sidebar with the 'Cisco vManage' logo and a menu with 'Monitor', 'Configuration', 'Tools', and 'Maintenance'. The 'Configuration' menu item is expanded, showing 'Devices', 'TLS/SSL Proxy', 'Certificates', 'Network Design', and 'Templates'. The 'Templates' item is selected. The main content area is titled 'Configuration - Templates' and has tabs for 'Profiles', 'Device Templates', and 'Feature Templates'. The 'Feature Templates' tab is active. Below the tabs, there's a 'Feature Template' section with a search bar and a list of devices. The 'ThousandEyes Agent' template is highlighted with an orange box. The template is a grid of features: Cisco OSPF (WAN, LAN), Cisco OSPFV3 (WAN, LAN), Cisco PIM (LAN), Cisco SIG Credentials, Cisco SNMP, EIGRP (LAN), GPS (WAN), Probes, Switch Port (Management, WAN, LAN), T1/E1 Controller (WAN), ThousandEyes Agent, and TrustSec.

- Select supported devices and define ThousandEyes Agent template
- If you don't see the template, you have selected an unsupported device

# Configuring a Feature Template

- Set Account Group Token (global)
- Specify VPN
- Set device specific variable for Agent IP Address and default gateway
- Depending on your environment, you can set the Advanced settings globally, device specific or default

The screenshot shows the Cisco vManage interface for configuring a Feature Template. The breadcrumb trail is "Feature Template > Add Template > ThousandEyes Agent". The "Device Type" is set to "C8200-1N-4T,C8200L-1N-4T,C8300-1N1S-4T2X,C8300-1N1S-6T,C8300-2N2S-4T2X,C8300-2N2S-6T,ISR4221X,ISR4321,ISR4331,ISR4351,ISR4431,ISR4451-X,ISR4461". The "Template Name" and "Description" are both "ThousandEyes-Embedded-Agent".

The "BASIC CONFIGURATION" section includes:

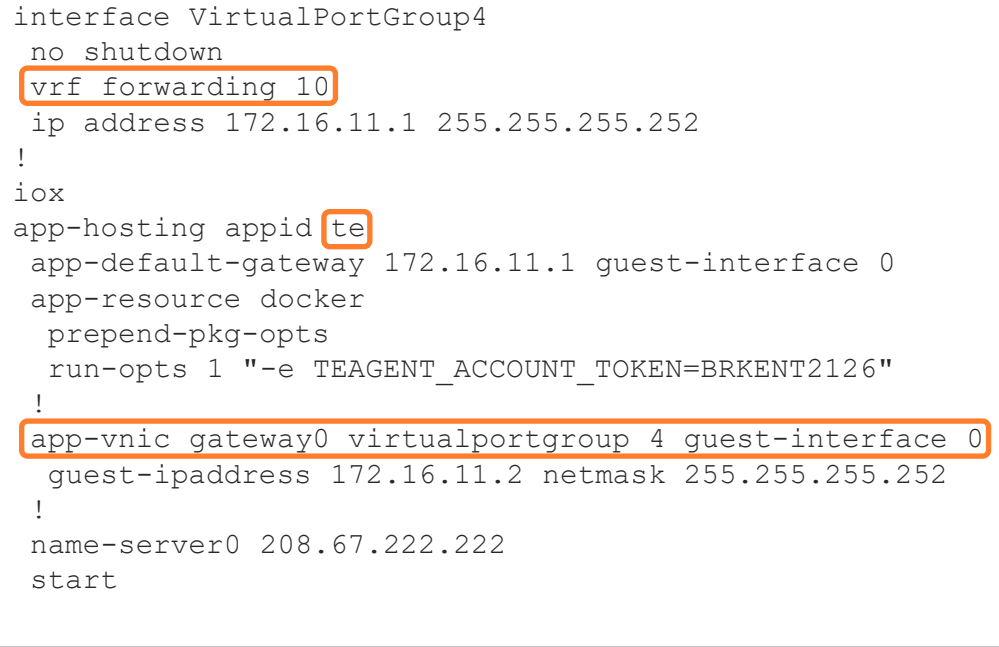
- Account Group Token: A dropdown menu with a globe icon.
- VPN: A dropdown menu with a globe icon, set to "10".
- Agent IP Address: A dropdown menu with a globe icon, set to "172.16.11.2/30".
- Agent default gateway: A dropdown menu with a globe icon, set to "172.16.11.1".

The "ADVANCED" section includes:

- Name Server: A dropdown menu with a globe icon, set to "208.67.222.222".
- Hostname: A dropdown menu with a refresh icon.
- Web Proxy Type: Radio buttons for "Static" (selected) and "PAC".

At the bottom, there are "Cancel" and "Save" buttons.

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```
interface VirtualPortGroup4
  no shutdown
  vrf forwarding 10
  ip address 172.16.11.1 255.255.255.252
!
!
iox
app-hosting appid te
  app-default-gateway 172.16.11.1 guest-interface 0
  app-resource docker
  prepend-pkg-opts
  run-opts 1 "-e TEAGENT_ACCOUNT_TOKEN=BRKENT2126"
!
app-vnic gateway0 virtualportgroup 4 guest-interface 0
  guest-ipaddress 172.16.11.2 netmask 255.255.255.252
!
name-server0 208.67.222.222
start
```



# Troubleshooting

```
cEdge# show app-hosting list
```

```
App id                               State
```

```
-----  
te                                   RUNNING
```

```
cEdge# app-hosting connect appid te session /bin/bash
```

```
root@TEA: more /var/log/agent/te-agent.log
```

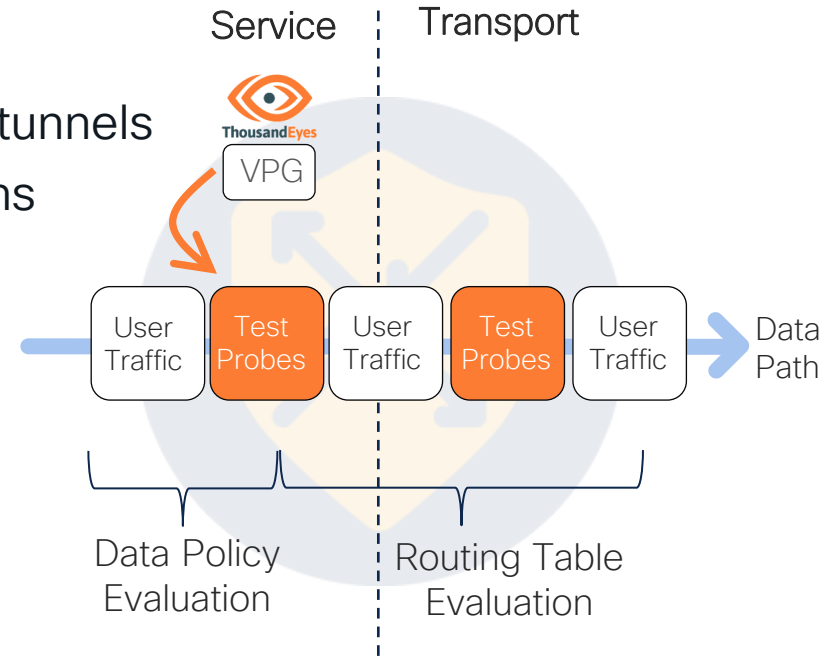
```
2022-06-09 10:42:59.307 INFO [20047f00] [te.agent.status] {} ThousandEyes Agent starting up  
2022-06-09 10:42:59.309 DEBUG [20047f00] [te.agent.AptPackageInterface] {} Initialized APT package interface  
2022-06-09 10:42:59.309 INFO [20047f00] [te.agent.main] {} Agent version 1.138.0 starting.  
2022-06-09 10:42:59.310 DEBUG [20047f00] [te.agent.db] {} Vacuuming database  
2022-06-09 10:42:59.311 INFO [20047f00] [te.agent.db] {} Found version 53, expected version 53  
2022-06-09 10:42:59.322 DEBUG [20047f00] [te.agent.DnssecTaskProceessor] {} Agent is not running bind  
2022-06-09 10:42:59.323 INFO [20047f00] [te.agent.main] {} Configured crash report to  
https://crashreports.thousandeyes.com/submit  
2022-06-09 10:42:59.324 INFO [20047f00] [te.agent.main] {} Found id 504516  
2022-06-09 10:42:59.324 INFO [20047f00] [te.agent.ClusterMasterAdapter] {} Set clustermaster URL to  
https://scl.thousandeyes.com  
2022-06-09 10:42:59.324 INFO [20047f00] [te.agent.ClusterMasterAdapter] {} Attempting to get controller assignment from  
https://scl.thousandeyes.com  
2022-06-09 10:43:01.369 INFO [20047f00] [te.agent.ClusterMasterAdapter] {} https://scl.thousandeyes.com told us we should talk  
to controller cl.thousandeyes.com  
2022-06-09 10:43:01.397 DEBUG [20047f00] [te.agent.NtpClient] {} Sending NTP packet to pool.ntp.org (193.2.78.228)  
<-- output omitted -->
```

# Second Step: Steering Test Traffic



# Common Objectives

- Basic approach: follow preferred/best paths
- Advanced approach:
  - Steer test traffic over redundant overlay tunnels
  - Steer test traffic over redundant DIA paths
- Options for matching test traffic
  - Source IPs
  - Destination IPs & ports
  - DSCP coloring



# Steering Test Traffic over Redundant Overlay Paths

```
data-policy Overlay-A2A
vpn-list VPN10
sequence 1
  match
    dscp 46
    source-data-prefix-list All_TE_Agents
    destination-data-prefix-list All_TE_Agents
  !
  action accept
  set
    local-tloc-list
    color gold
    encaps ipsec
    restrict
  !
!
sequence 11
  match
    dscp 40
    source-data-prefix-list All_TE_Agents
    destination-data-prefix-list All_TE_Agents
  !
  action accept
  set
    local-tloc-list
    color silver
    encaps ipsec
    restrict
  !
!
default-action accept
```

```
lists
data-prefix-list All_TE_Agents
ip-prefix 192.168.255.0/24
!
site-list all-sites
site-id 1-1000
vpn-list VPN10
vpn 10
!
apply-policy
site-list all-sites
data-policy Overlay-A2A from-service
```

The screenshot displays the Cisco SD-WAN configuration interface for a 'Custom' policy. It shows two sequence rules, 1 and 11, which are identical. Each rule is configured with the following match conditions and actions:

Match Conditions	Actions
DSCP: 46	Accept
Source Data Prefix List: All_TE_Agents	Local TLOC List: gold
Source: IP	Encapsulation: IPSEC
Destination Data Prefix List: All_TE_Agents	Restrict: true
Destination: IP	

The interface includes a 'Sequence Type' dropdown set to 'Custom', a 'Drag & drop to reorder' handle, and a 'Default Action' section. The 'Match Conditions' and 'Actions' sections are numbered 1 and 2 respectively, corresponding to the sequence numbers in the configuration.

# Steering Test Traffic over Redundant DIA Paths

```
data-policy VPN10-Redundant-DIA-Paths
vpn-list VPN10
sequence 1
  match
    dscp 46
    source-data-prefix-list All_TE_Agents
  !
  action accept
  nat use-vpn 0
  set
    local-tloc-list
      color public-internet
      encaps ipsec
      restrict
  !
sequence 11
  match
    dscp 40
    source-data-prefix-list All_TE_Agents
  !
  action accept
  nat use-vpn 0
  set
    local-tloc-list
      color biz-internet
      encaps ipsec
      restrict
  !
default-action accept
```

Centralized Policy > Data Policy > Edit Data Policy

Name\* Redundant-DIA-Paths

Description\* Redundant-DIA-Paths

[+ Sequence Type](#)

Drag & drop to reorder

Custom

Default Action

**Custom**

[+ Sequence Rule](#) Drag and drop to re-arrange rules

1

Match Conditions	Actions
DSCP: 46	Accept
Source Data Prefix List: All_TE_Agents	NAT VPN: 0
Source: IP	Fallback
	Local TLOC List: public-internet
	Encapsulation IPSEC
	Restrict true

2

Match Conditions	Actions
DSCP: 40	Accept
Source Data Prefix List: All_TE_Agents	NAT VPN: 0
Source: IP	Fallback
	Local TLOC List: biz-internet
	Encapsulation IPSEC
	Restrict true

# Last Step: Configuring Tests



# Network Tests: A2A vs A2S

- Prefer Agent to Agent tests whenever possible
  - Supports bidirectional testing
  - Detects asymmetrical paths
  - Supports also UDP
- Challenges when monitoring underlay
  - Reachability of the target agent for A2A tests
    - Agent present in the underlay vs NAT\*
  - Selecting relevant test target for A2S tests
- Use different ports or DSCP for matching test traffic with data policy

The screenshot shows the 'New Test' configuration page. At the top, there are tabs for 'Layer' (Routing, Network, DNS, Web, Voice) and 'Test Type' (Agent to Server, Agent to Agent). The 'Test Name' is 'A2A-SDWAN' and the 'Test Description' is 'BRKENT-2126'. Below this, there are two tabs: 'Basic Configuration' and 'Advanced Settings'. Under 'Advanced Settings', the 'NETWORK' section has a 'Server Port' field set to '49153'. The 'MSS' is set to 'Auto' with a 'Manual' button and a '200 bytes' input. There is a checkbox for 'Collect BGP data' which is checked, with a note 'All public BGP monitors will be included'. The 'Transmission Rate' has an unchecked checkbox for 'Enforce fixed packet rate'. The 'No. of Path Traces' is set to 'Default (3)' with a checked checkbox. At the bottom, the 'DSCP' is set to 'Best Effort (DSCP 0)'.

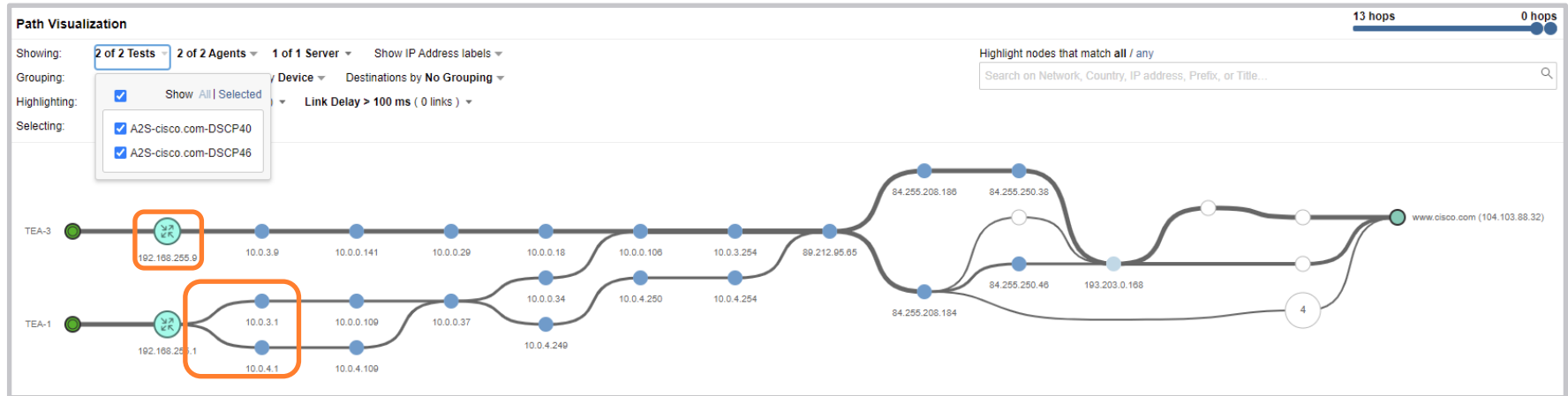
# Web Layer Tests

- Matching different web test traffic with an SD-WAN data policy becomes a challenge:
  - No DSCP coloring options, source ports settings, etc.
  - Only HTTP Server test supports different source interfaces\*
- BrowserBot is needed for Page Load and Transaction tests
- Alternative – Multiple agents



# Improving Visualization

- Combine individual tests using multi-views
- Enable SNMP on SD-WAN edges and utilize Device Layer monitoring



# Key Takeaways

- Select deployment model that fits best into your environment.
- Adapt SD-WAN policy based on a planned testing scenarios.
- Leverage different test configuration options to monitor alternative paths.

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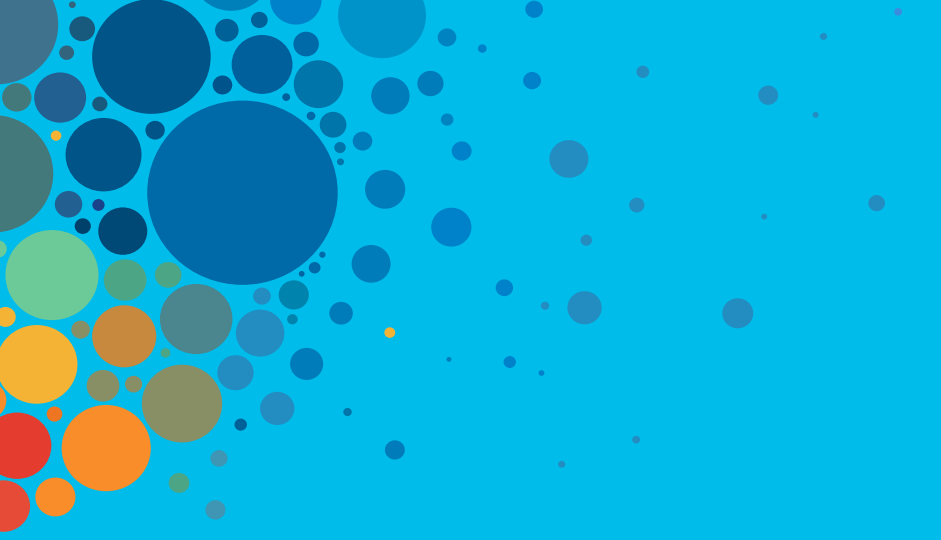
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