Benefits of Application Visibility and Control (AVC)

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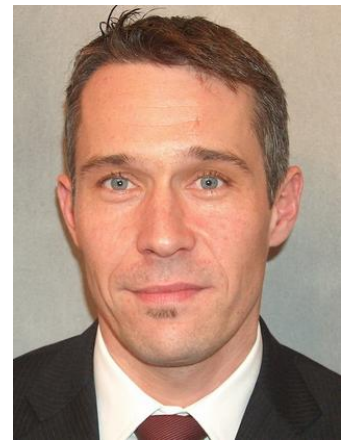

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- For WebEx audio, select COMMUNICATE > Join Audio Broadcast

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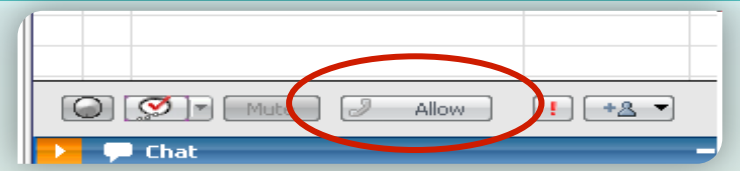

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Business and IT are Changing Like Never Before

Drastic Change in Application Type, Delivery, and Consumption







Users/
Machines

Proliferation
of Devices

How Application are Consumed

Business and IT are Changing Like Never Before

Drastic Change in Application Type, Delivery, and Consumption







Users/
Machines

Proliferation
of Devices

Storage

Private
Cloud

VDI | IaaS

Database

ORACLE

Microsoft Exchange

Microsoft

SAP

EMC²

CITRIX

How applications are Delivered

Business and IT are Changing Like Never Before

Drastic Change in Application Type, Delivery, and Consumption

Users/
Machines

Proliferation
of Devices

ScanSafe

Cisco webe

terremark

salesforce

Public/Hybrid
Cloud

SaaS/IaaS

Microsoft Office SharePoint

Gmail

verizon

amazon web services

dreamforce

Storage

Database

Private
Cloud

VDI | IaaS

ORACLE

Microsoft Exchange

Microsoft

SAP

EMC²

CITRIX

Type of applications

Business and IT are Changing Like Never Before

Drastic Change in Application Type, Delivery, and Consumption

60% of IT professional cites performance as key challenge for cloud

Performance is key

When users complain about Application Problem

What the users see ?	IT team	The Network administrator
		
My applications are so slow I cannot get any work done today	My servers work fine, it must be the network	I do not see anything wrong

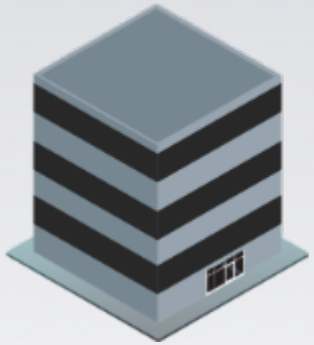
Where does the problem come from ? Increased Latency, WAN, Application, Server, PC, User

Cisco Cloud Intelligent Network

Delivering Optimal Experience, Pervasive Security, and Simplified Operations

Management and Policy

Users



Branch

Cloud Connectors

Collaboration Survivability

Web Security

Cloud Storage

3rd Party

Network Services for Cloud

Visibility | Optimization | Security | Collaboration | App Hosting

Cloud Intelligent Platforms

ISR G2

Branch Office

ASR 1K

Campus / Data Center

CSR 1KV

Cloud

Cloud Services

Private/Public/Hybrid

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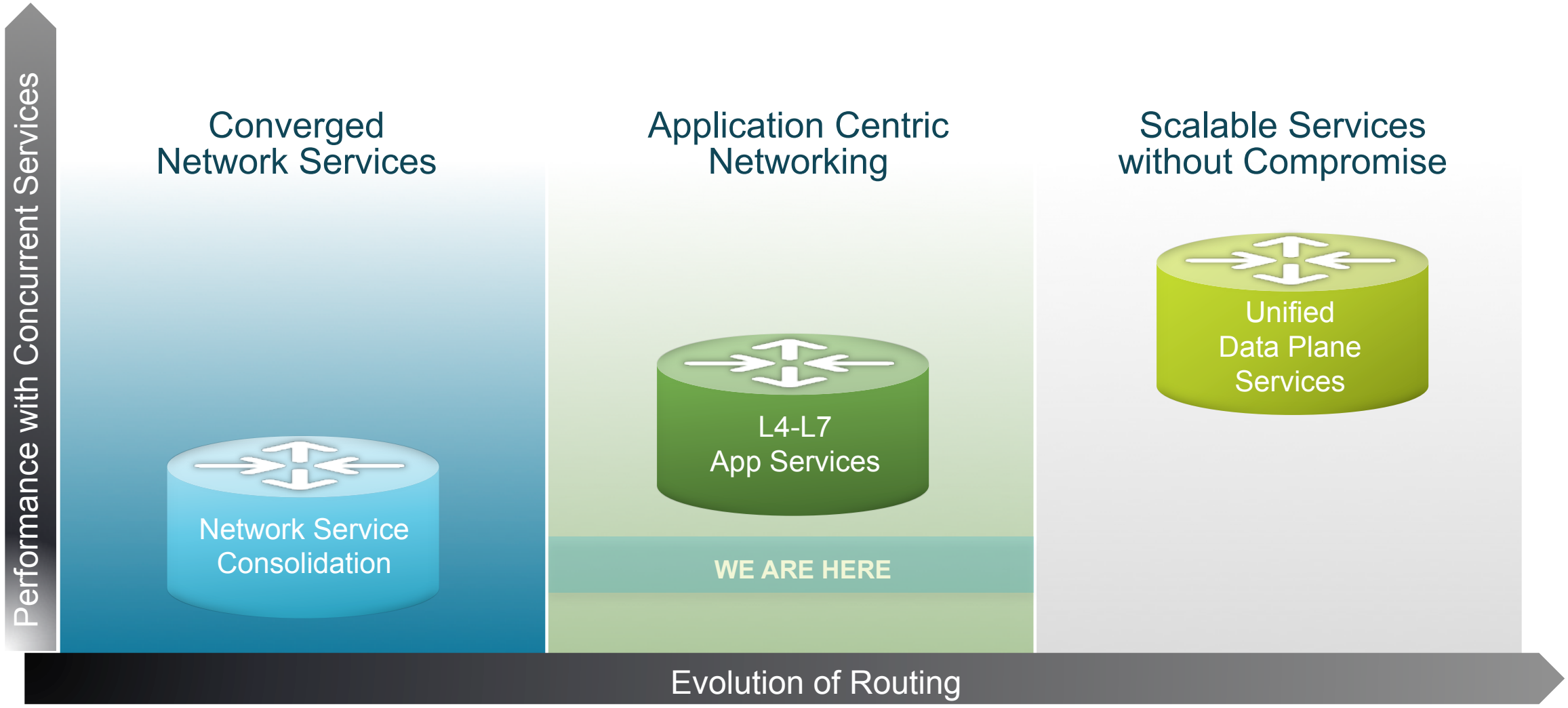
Cisco Router Vision

Optimize Rich Service Integration and Performance to Meet Business Needs



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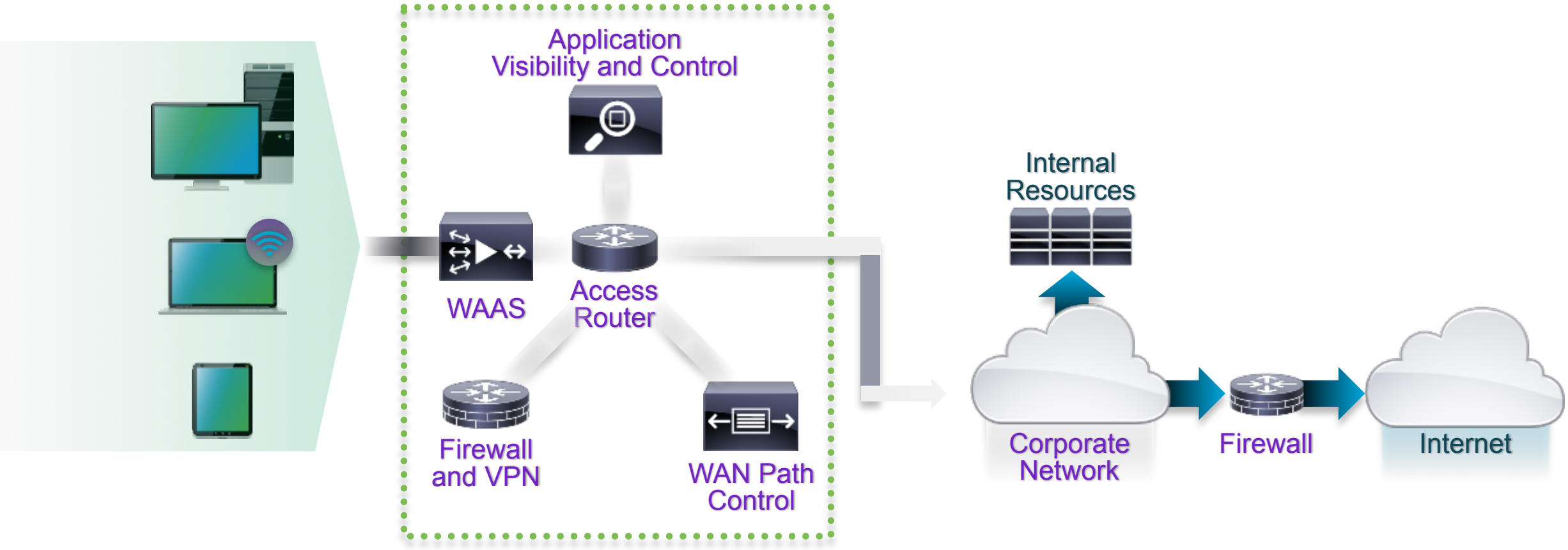
Network IT Complexity with Overlay Appliances



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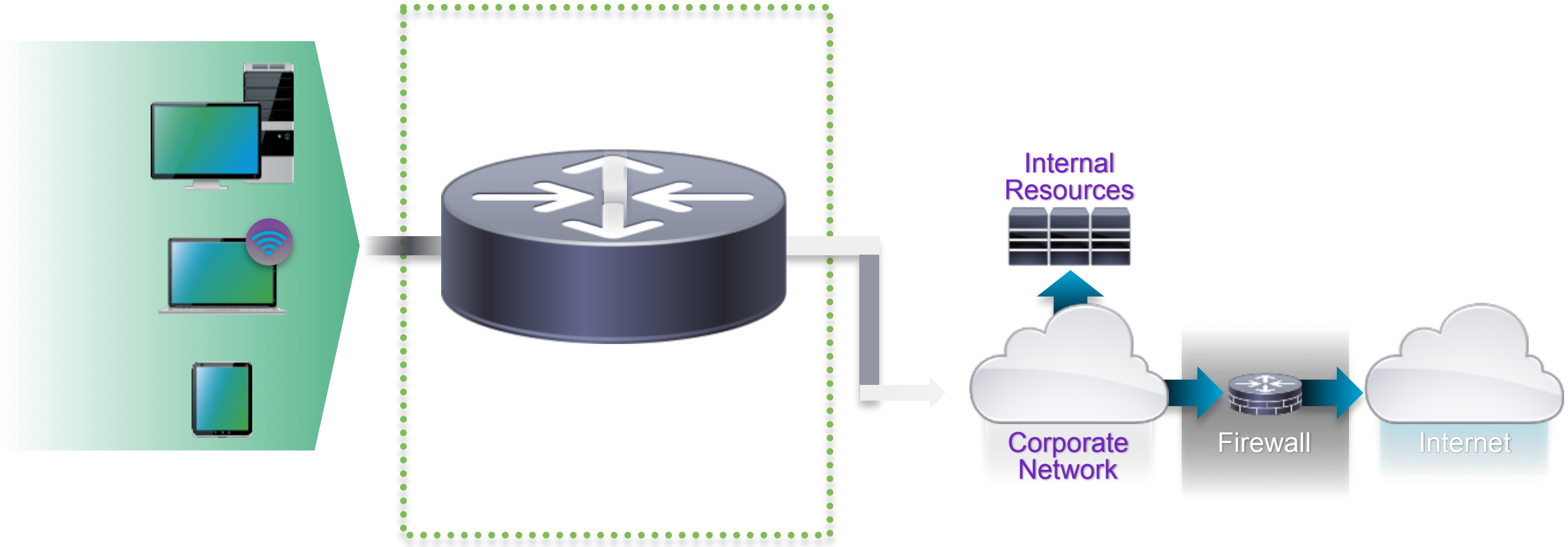
Cisco's Approach: One Network with Unified Services



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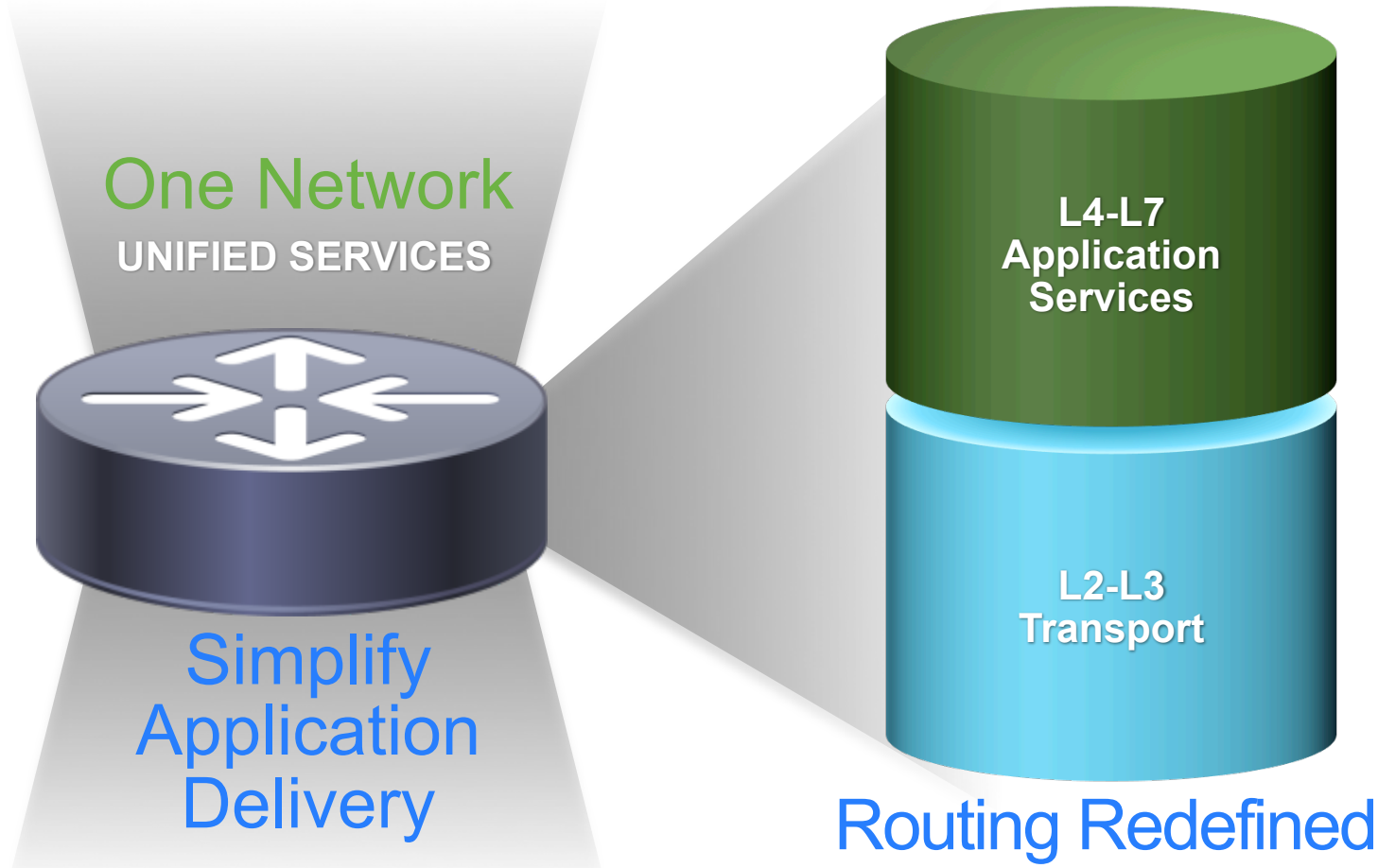
Cisco's Approach: One Network with Unified Services



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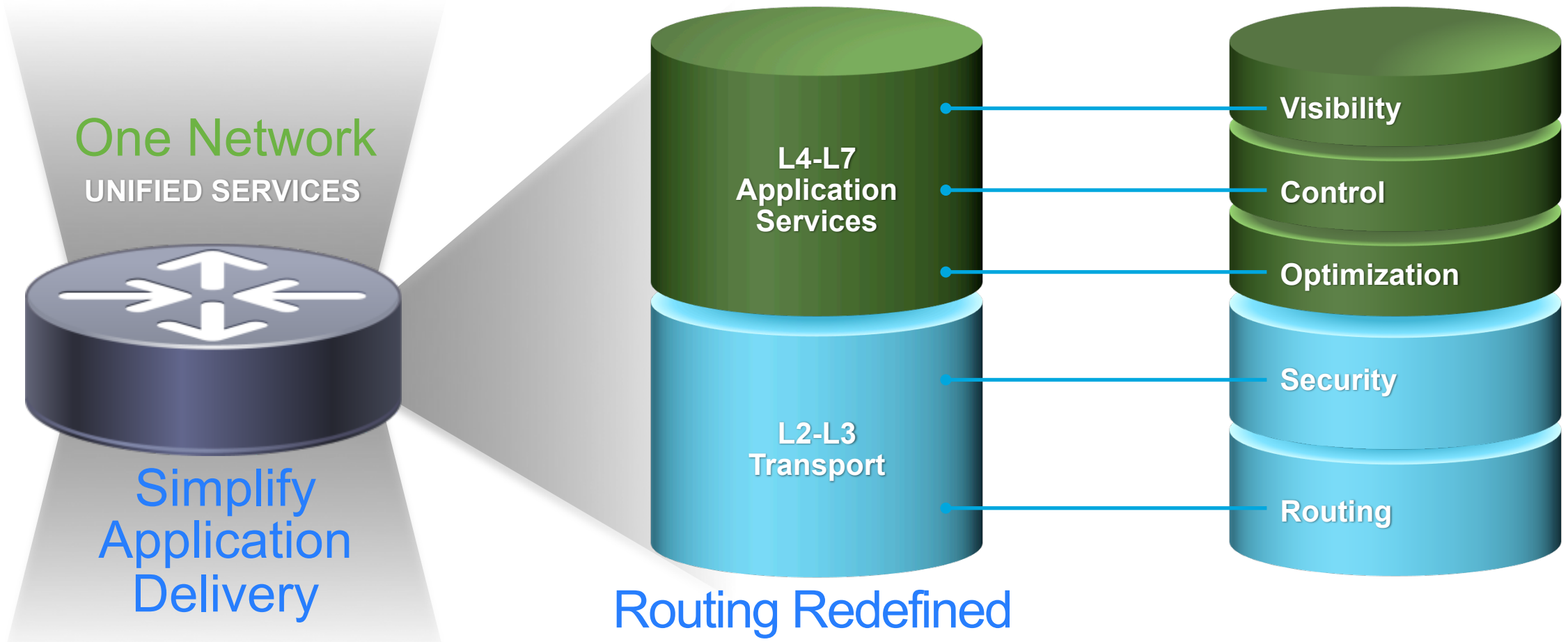
Cisco's Approach: One Network with Unified Services



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Application Visibility and Control

The Solution to manage the network… and control your transition to the cloud

Discover: 1000+ applications categorized to simplify management

Performance Collection:
Enhanced application performance reports, url hit counts, top applications …

Control: Apply QoS, Acceleration and Path Control according to company performance expectations

Application Visibility and Control	Natively Integrated into Cisco Routers	Simple to Enable

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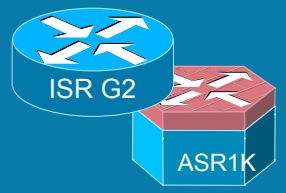
What is Application Visibility and Control (AVC)

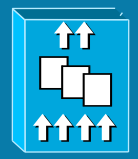
What is Needed

Application Recognition

Identify applications using L3 to L7 information



NFv9/IPFIX



Reporting Tools

Perf. Collection & Exporting

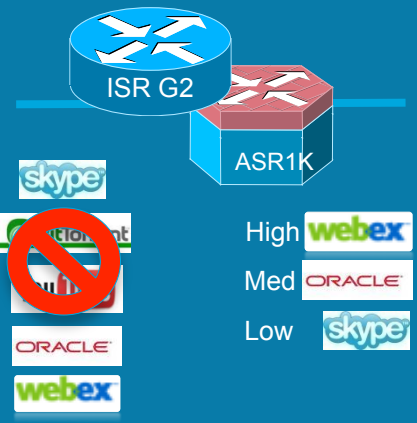
Collect application performance metrics, and export to management tool

App Visibility & User Experience Report

App	BW	Transaction Time	…
SAP	3M	150 ms	…
Sharepoint	10M	500 ms	…

Management Tool

Advanced reporting tool aggregates and reports application performance



Control

Control application network usage to improve application performance

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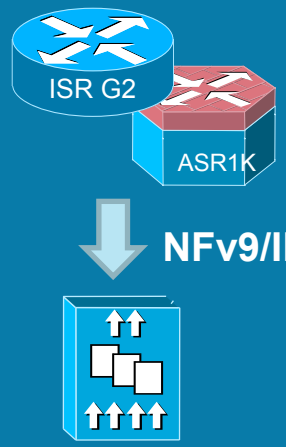
What is Application Visibility and Control (AVC)

Enabled Technologies

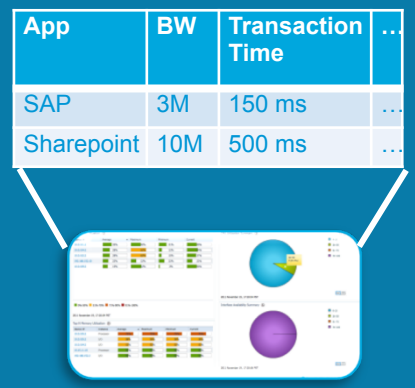
Application Recognition

- NBAR2
- Metadata



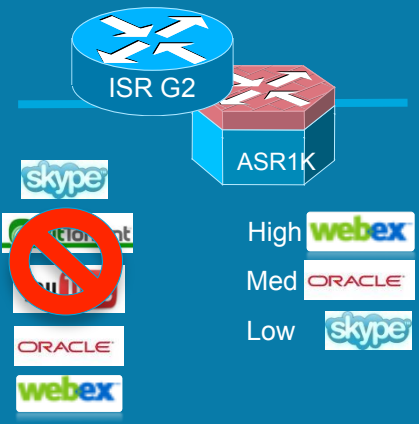
Perf. Collection & Exporting

- Unified Monitoring
  - Traffic Statistics
  - Response Time
  - Voice/Video Monitoring
  - URL Collection



Management Tool

- Cisco Prime Infrastructure
- 3rd Party Tools



Control

- QoS (w/ NBAR2)
- PfR

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AVC Solution Offering

Internet Edge

- Discover application usage on Internet router
- Traffic shaping limit recreational, bandwidth hogging application, i.e. P2P
- GUI for reporting and configuration

Managed Service Provider

- Provide value added services from the same CPE used for connectivity
- Application visibility and application performance report
- 3rd Party Reporting tool integration

Enterprise WAN

- Branch and WAN aggregation deployment
- Application-aware Network Performance Monitoring
- Application-aware QoS and intelligent path selection
- Integration with enterprise infrastructure, i.e. switch, wireless

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Application Recognition
Discover – NBAR2 and Metadata

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What is An Application?

HTTP		80
FTP	Are these applications?	20/21
POP3		110
IMAP	Or just ports?	143
HTTPS		443
SMTP		25

What about these?

webex
Rhapsody
Gmail by Google BETA
YouTube
McAfee
skype
Microsoft Exchange
Google talk BETA
Microsoft Office Live Meeting
BitTorrent
iTunes
Windows Server Update Services
Office SharePoint Server 2007
salesforce.com

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Application Recognition in Enterprise

Port based (ACL)

Up to Layer 4 analysis

ACL and NBAR2

+1000 signatures embedded in ISR and ASR1k

Up to the application level

Embedded in ISR and ASR

ACL, DPI and Metadata

Interact with application to go deeper into the end user flows

+1000 signatures embedded in ISR and ASR1k

Up to the application level

Adding support on Unified Access (Wireless controller, 3850)

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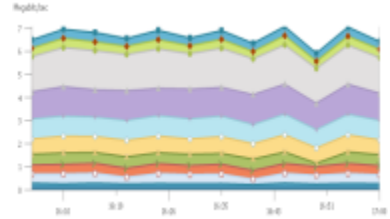
Discover
Identify and Monitor 1000+ Applications Natively

Top Talkers

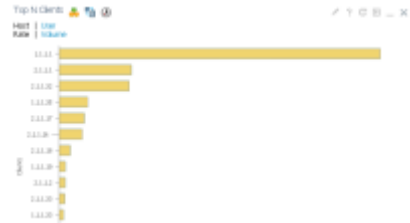
Latency

Bandwidth

netflow-v9
IPFIX



Capacity Planning



Monitoring & Troubleshooting

L7 Classification

Integrated DPI engine (NBAR2) recognizes 1000+ applications

In-service application signature update

Performance Collection

Collect traffic statistics and 50+ performance metrics

Export information using open export protocols such as netflow-v9 and IPFIX

http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6558/ps6616/product_bulletin_c25-627831.html

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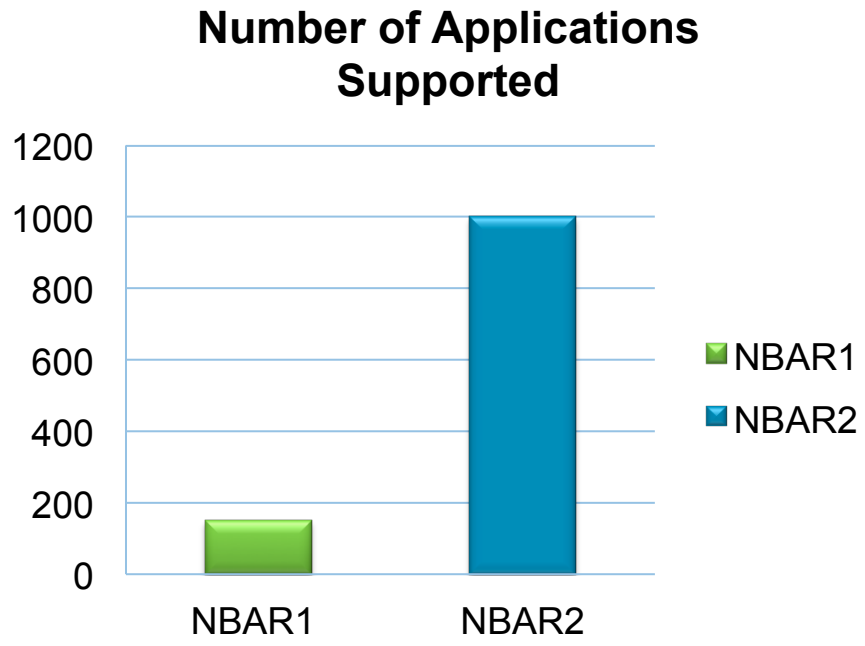
NBAR2 Highlight



HTTP URI

HTTP Hostname

Browser Type

Trafic par hostname

1 - 6 on 116 | 1 | 2 | 3 | 4 | 5 | 6 | 10 | 20

Hits	Hostname	Entrant	Sortant
17	www.cnn.com	546.46 Ko	109.23 Ko
15	ads.cnn.com	54.87 Ko	78.97 Ko
12	i.cdn.turner.com	251.56 Ko	23.64 Ko
12	mi.adinterax.com	608 Octets	1.92 Ko
12	cdn.ndtv.com	-	480 Octets
11	d3.zedo.com	176.28 Ko	37.94 Ko

- More than 1000 applications support and growing
- Categorization to simplify application management
- In-service signature update through Protocol Pack

- Field Extraction – collect application specific information in addition to identify applications
- Sub-port Classification – match parameters of the applications

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Simplify Application Management with NBAR2 Attributes

- NBAR2 attribute provides grouping of similar types of applications
- Use attributes to report on group of applications or to simplify QoS classification
- 6 pre-defined attributes per application (can be reassigned by users)

Category	First level grouping of applications with similar functionalities
Sub-category	Second level grouping of applications with similar functionalities
Application-group	Grouping of applications based on brand or application suite
P2P-technology?	Indicate application is peer-to-peer
Encrypted?	Indicate application is encrypted
Tunneled?	Indicate application uses tunnelling technique

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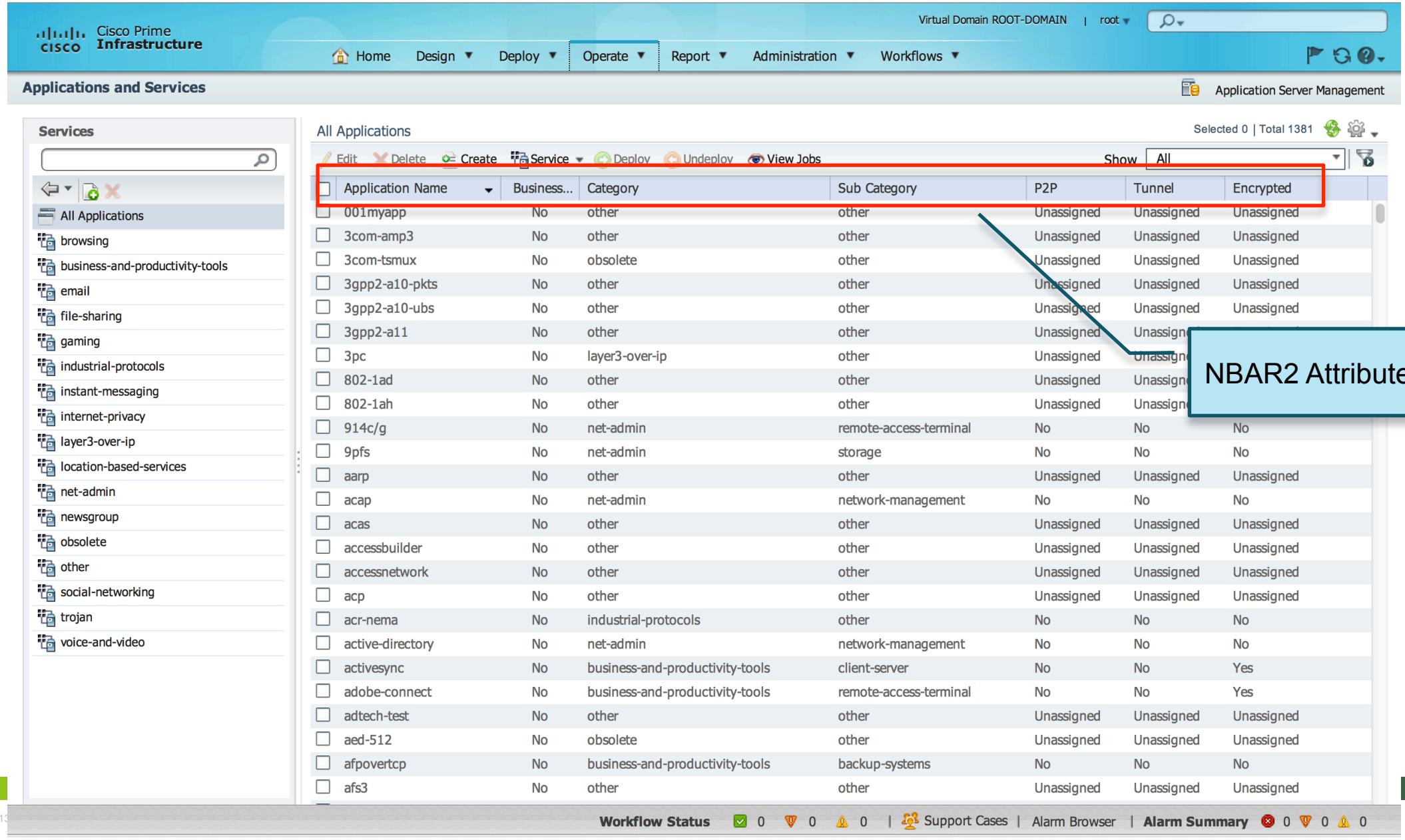
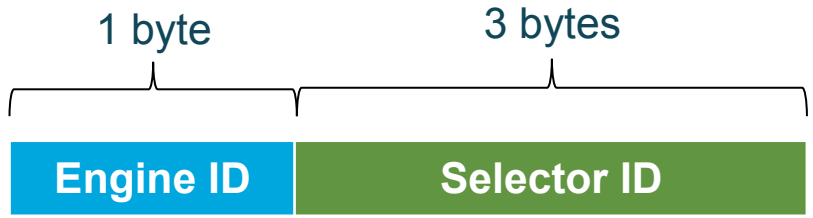
Grouping Apps for Reporting and Classification



Global Application ID

- Global Application Id: a unique Id per application reported of all DPI engines in Cisco
  - IOS ISR, IOS-XE ASR1k, Network Analysis Module, IOS Firewall
  - Future: WAAS Express, etc…
- An Cisco proprietary format, based on
  - On a L4 protocol, i.e. the IANA well known ports
  - On a L3 protocol, i.e. the IANA protocol type
  - On a L2 protocol, i.e. the Ethertype
  - On a L7 application/protocol: proprietary assignments (NO IANA registry for L7)



- Going to the IETF with this application id encoding
  - “Export of Application Information in IPFIX”, RFC 6759

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Define Your Own Application in NBAR2

Port

- TCP or UDP
- 16 static ports per application
- Range of ports (1000 maximum)

Payload

- Search the first 255 bytes of TCP or UDP payload
- ASCII (16 characters)
- Hex (4 bytes)
- Decimal (1-4294967295)
- Variable (4 bytes Hex)

HTTP URL

New

- URI regex
- Host regex

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NBAR2 Field Extraction
Overview

- Ability to look into specific applications for additional field information
- NBAR2 extracted fields from HTTP, RTP, Citrix, etc… for QoS configuration
- HTTP Header Fields
- Eases classification of voice and video traffic
  - VoIP, streaming/real time video, audio/video conferencing, Fax over IP
  - Distinguishes between RTP packets based on payload type and CODECS
- Some extracted fields within Flexible NetFlow and Unified Monitoring

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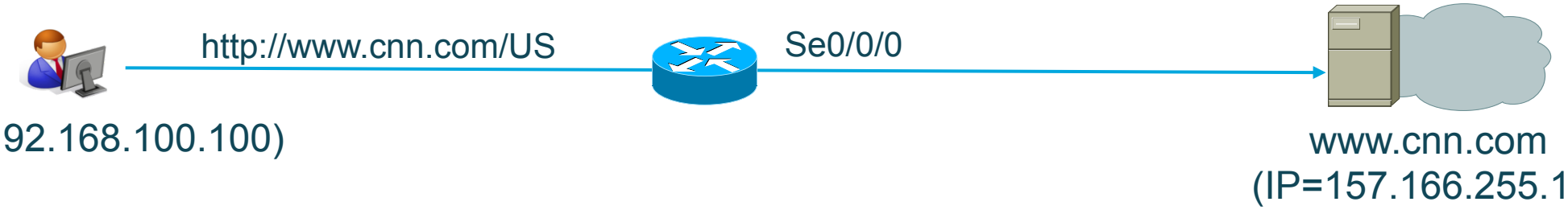
NBAR2 Field Extraction
HTTP Example



- Ability to extract information from HTTP message

collect application http url

collect application http user-agent

collect application http referer

```
GET /weather/getForecast?time=37&&zipCode=95035 HTTP/1.1
Host: svcs.cnn.com
User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64; rv:14.0) Gecko/
20100101 Firefox/14.0.1
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/
*;q=0.8
Accept-Language: en-us,en;q=0.5
Accept-Encoding: gzip, deflate
Connection: keep-alive
Referer: http://www.cnn.com/US/
```

collect application http host

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How NBAR2 can be used

- Protocol Discovery – “ip nbar protocol-discovery” CLI
  - Discovers and provides real time statistics on applications
  - Accounting: per-interface, per-application, bi-directional statistics:
    Bit rate (bps), Packet counts and Byte counts
  - Information available in the CISCO-NBAR-PROTOCOL-DISCOVERY-MIB
- Invoke ‘match protocol’ CLI in C3PL/MQC (class-map) CLI
  - Application optimization
  - Used in a number of different IOS functions (QoS, performance monitor, IOS FW)
- With Flexible NetFlow (regardless of QoS)
  - Invoke ‘match|collect application name’ fields in flexible netflow (FNF)
  - Application name/ID is included in NetFlow export reports

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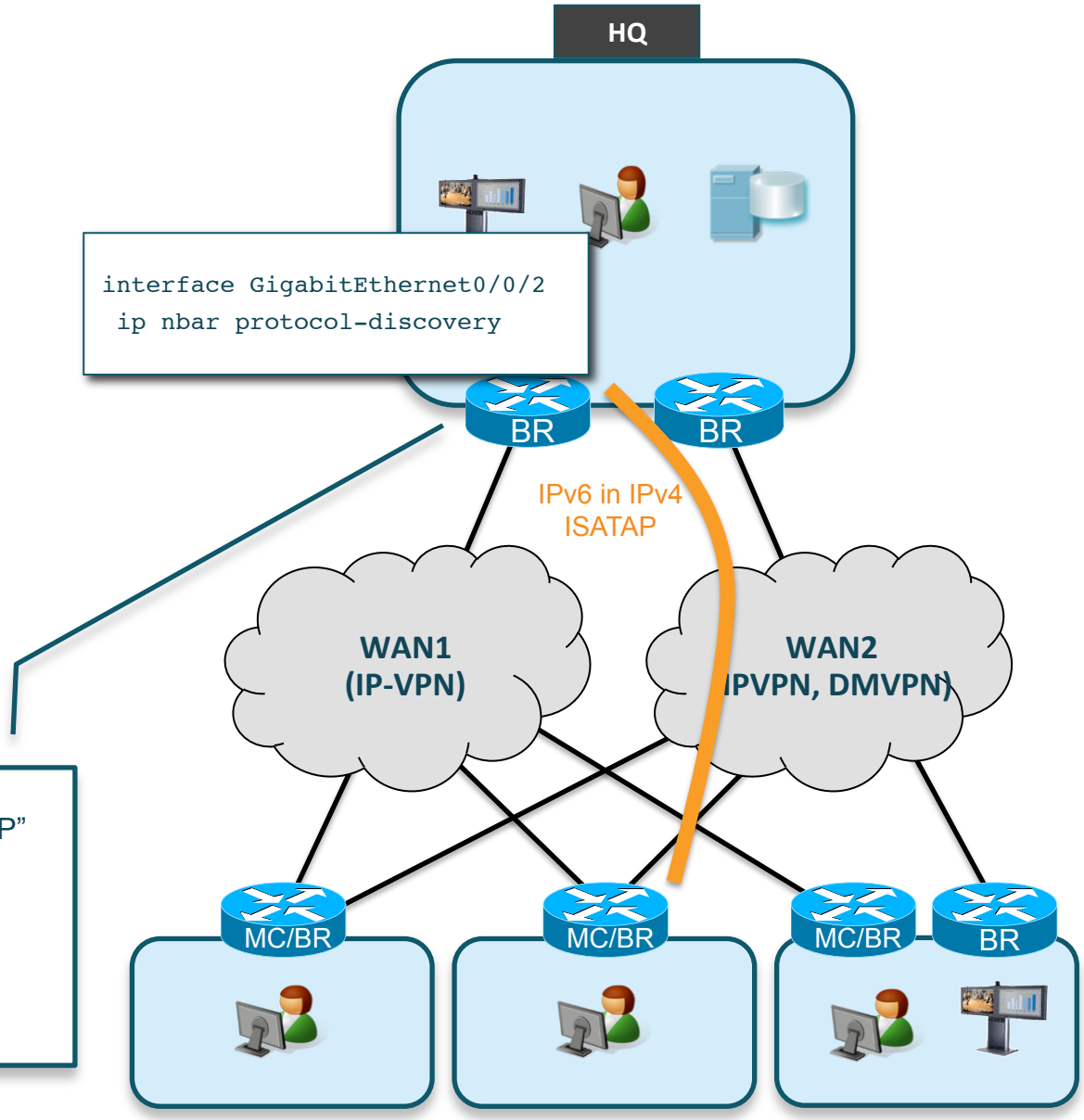
Protocol Discovery
IPv4 and IPv6 Classification

- Discover application protocols transiting an interface, and populate CISCO-NBAR-PROTOCOL-DISCOVERY-MIB
- Supports both input and output traffic
- Stateful application classification for IPv6 in IPv4 traffic
- Detection of IPv6 in IPv4 traffic (ISATAP, Teredo,6to4,..)



With IPv6 tunnel inspection turn ON, NBAR classifies this flow as “HTTP”

```
interface Gi1/1
  ip nbar classification tunneled-traffic ?
          ipv6inip Tunnel type ISATAP, 6to4 and 6RD
          teredo   Tunnel type TEREDO
```

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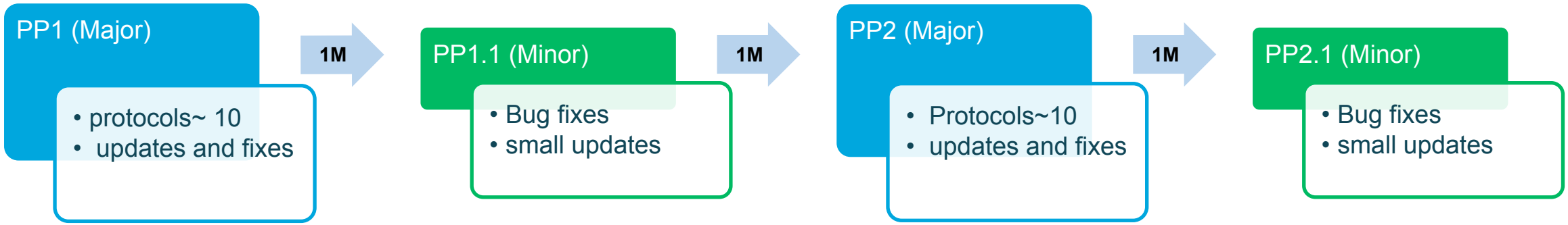
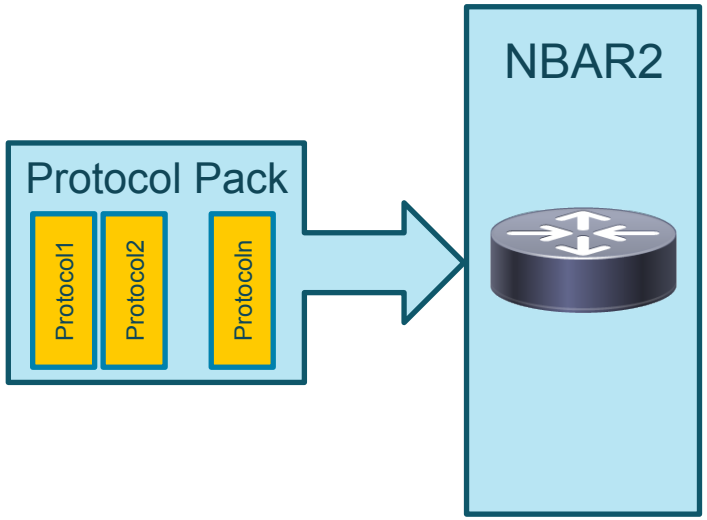
NBAR2 – Regular Updates
In-service Application Definition Update



- Standard Protocol Pack
  - Includes only subset of protocols
  - No Support for Traffic categorization and Attributes
  - Available (as Default Protocol pack) in IP Base image
  - No periodic releases and SLA
- Advanced Protocol Pack
  - Includes all supported Protocols / Applications
  - Support Traffic categorization and Attributes
  - Available (as Default protocol pack) in DATA image
  - Periodic releases and Offers SLA



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‘Standard’ vs ‘Advanced’ Protocol Pack

- NBAR2 Protocol Pack FAQ

  http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6558/ps6616/qa_C67-723689.htm

	Standard Protocol Pack	Advanced Protocol Pack
	• Include only subset of applications (85) • No NBAR2 attributes • No periodic Protocol Pack update	• Full applications (1000+) • Full access to NBAR2 attributes • Protocol Pack update every month
	IPbase License	Datak9 License
	FPI Feature License	AVC Feature License

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NBAR2 Protocol Pack

Download Software

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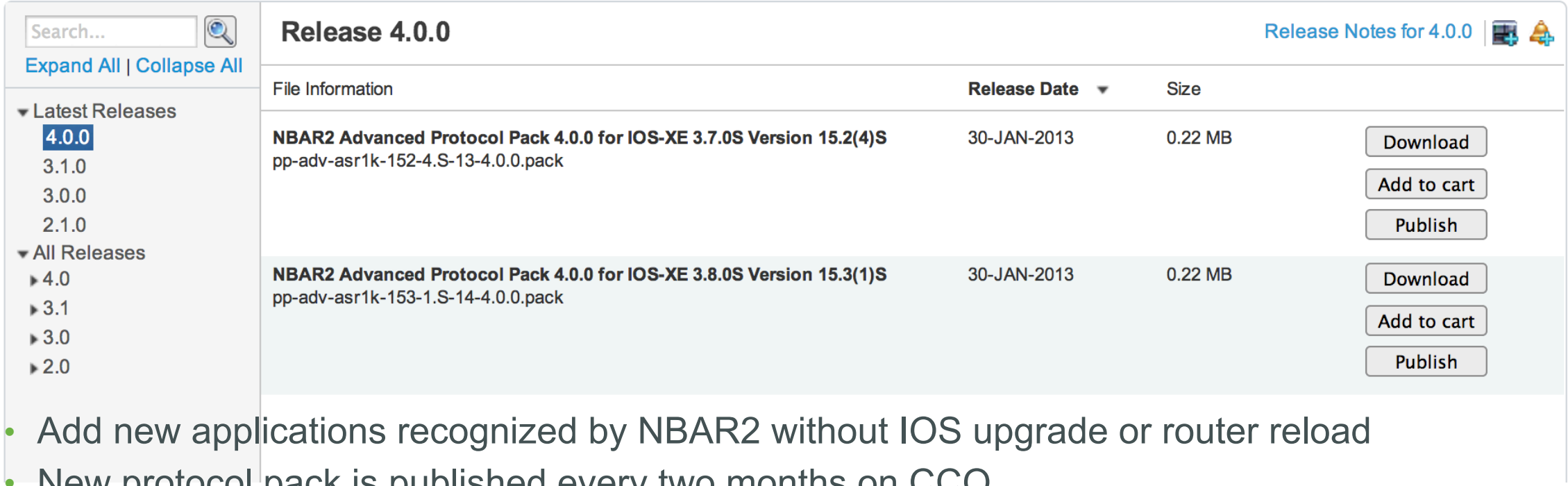
Downloads Home > Products > Routers > WAN Aggregation and Internet Edge Routers > Cisco ASR 1000 Series Aggregation Services Routers > Cisco ASR 1004 Router > **NBAR2 Protocol Packs-4.0.0**

Cisco ASR 1004 Router



- Add new applications recognized by NBAR2 without IOS upgrade or router reload
- New protocol pack is published every two months on CCO
- Single IOS CLI to enable the protocol pack

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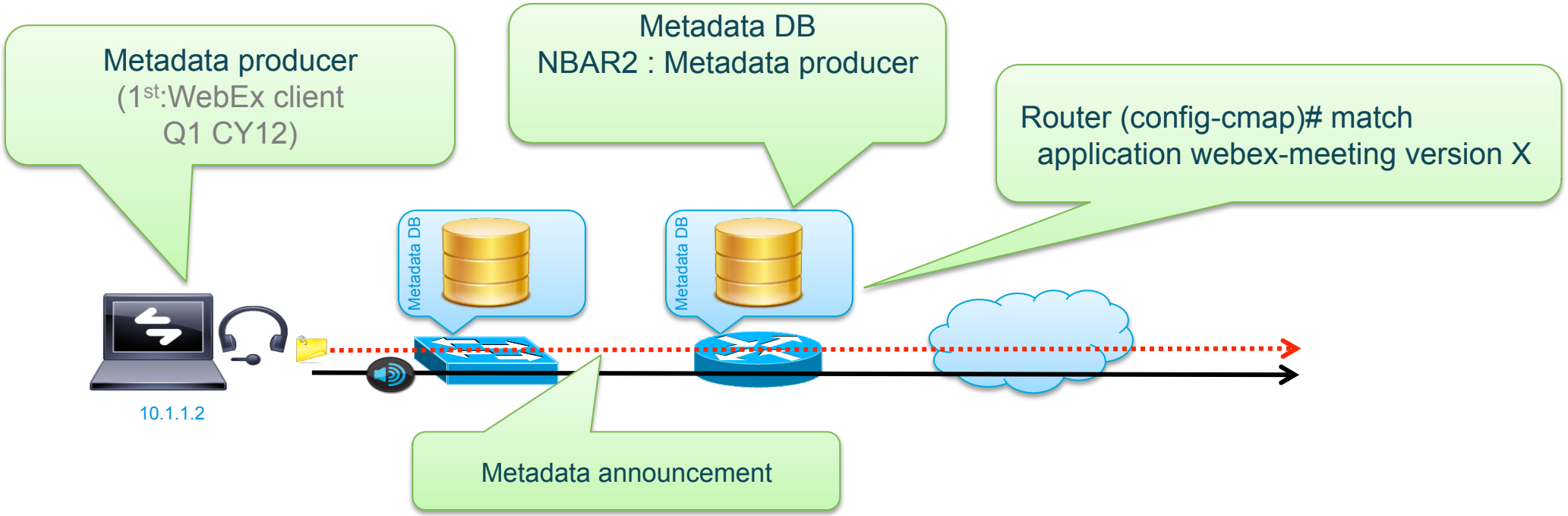
Introduction of Metadata

Overview



- Metadata protocol: announces flow parameters and attributes to network nodes along a path
- Metadata flow DB: maintains flow attribute information, and coordinates metadata producers/consumers.
  - Producer: creates metadata information
  - Consumer: utilizes metadata information
- QoS can match metadata attributes
- Nodes that do not support metadata will pass it silently

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List of Metadata Capable Endpoints

End point/application	Release/Timeframe	Status
Cisco WebEx Meeting Applications	WebEx Business Suite - WBS28 or Higher	Shipped
Cisco Telepresence EX series	TE 6.0	Shipped
Cisco Jabber for Windows	UC 9.0(1) or Higher	Shipped
Cisco Telepresence TX 9000 series	TX 6.0	Shipped
Cisco Telepresence TX 1300 series	TX 6.0	Shipped
Cisco Telepresence Profile series	TC 6.0	Shipped
Cisco Telepresence MX series	TC 6.0	Shipped
Cisco Telepresence SX series	TC 6.0	Shipped
Cisco Telepresence Integrator C series	TC 6.0	Shipped
Cisco VXC client	1H CY 2013	Planned - 1H CY 2013

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Performance Collection
Stats, URL, ART, Media Monitoring

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Performance Collection & Exporting – What is it?

- **Integrated** performance monitoring available for different type of applications and use cases

Performance Collection

Voice and Video Performance (Media Monitoring)

30% of traffic is voice and video

Critical Applications Performance (Application Response Time)

40% of traffic is critical applications

Application Statistics

What applications, how much bandwidth, flow direction? (Flexible Netflow and NBAR2)

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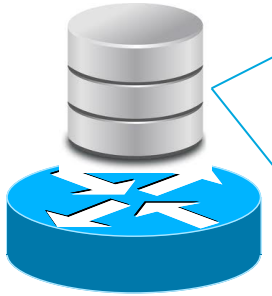
Flexible NetFlow (FNF)
Concept

Set of fields which identify unique entry to track

Define which information to collect

FNF Cache



Keyed Fields				Non-Keyed Fields			
Src IP	**Dst IP**	**App ID**	**…**	**Pkt**	**Byte**	**Input If**	**…**
1.1.1.1	2.2.2.2	0x10		10	2000	Fa0/0	
1.1.1.1	3.3.3.3	0x10		9	10000	Fa0/0	
2.2.2.2	1.1.1.1	0x10		15	15000	Fa0/1	
3.3.3.3	4.4.4.4	0x11		20	2000	Fa0/1	
1.1.1.1	2.2.2.2	0x20		10	500	Fa0/0	

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Tracking Traffic Flow with FNF

Key Fields	Packet 1
Source IP	1.1.1.1
Destination IP	2.2.2.2
Source port	23
Destination port	22078
Layer 3 Protocol	TCP - 6
TOS Byte	0
Non-key Fields	**Packet 1**
Length	1250

- If packet key fields are unique, new entry in flow record is created
  - First packet of a flow will create the Flow entry using the Key Fields"
  - Remaining packets of this flow will only update statistics (bytes, counters, timestamps)
- Otherwise, update the non-key fields, i.e. packet count

Key Fields	Packet 2
Source IP	3.3.3.3
Destination IP	4.4.4.4
Source port	80
Destination port	22079
Layer 3 Protocol	TCP - 6
TOS Byte	0
Non-key Fields	**Packet 2**
Length	519

Netflow Cache After Packet 1

Source IP	Dest. IP	Dest. I/F	Protocol	TOS	…	Pkts
1.1.1.1	2.2.2.2	E1	6	0	…	11000

Netflow Cache After Packet 2

Source IP	Dest. IP	Dest. I/F	Protocol	TOS	…	Pkts
3.3.3.3	4.4.4.4	E1	6	0	…	50
1.1.1.1	2.2.2.2	E1	6	0	…	11000

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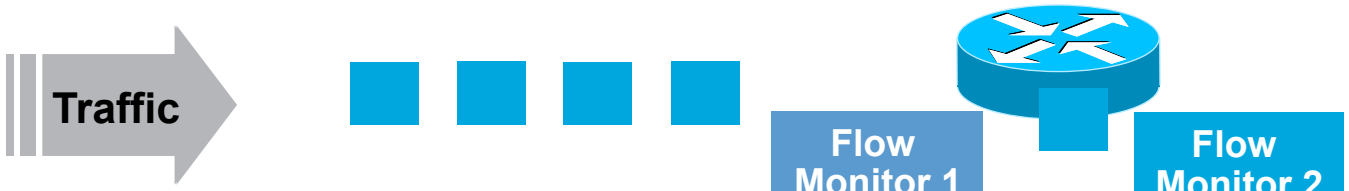
Flexible NetFlow
Multiple Monitors with Unique Key Fields



Key Fields	Packet 1
Source IP	3.3.3.3
Destination IP	2.2.2.2
Source Port	23
Destination Port	22078
Layer 3 Protocol	TCP - 6
TOS Byte	0
Input Interface	Ethernet 0

Non-Key Fields
Packets
Bytes
Timestamps
Next Hop Address

Key Fields	Packet 1
Source IP	3.3.3.3
Destination IP	2.2.2.2
Input Interface	Gi0/1
SYN Flag	0

Non-Key Fields
Packets
Timestamps

Traffic Analysis Cache

Source IP	Dest. IP	Source Port	Dest. Port	Protocol	TOS	Input I/F	…	Pkts
3.3.3.3	2.2.2.2	23	22078	6	0	E0	…	1100

Security Analysis Cache

Source IP	Dest. IP	Input I/F	Flag	…	Pkts
3.3.3.3	2.2.2.2	Gi0/1	0	…	11000

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What do we want to monitor?

Traffic Statistics

- Application Usage per client IP/subnet/site
- Top clients per application

URL Visibility

- Most visited web-site
- Per-URL application response time

Application Response Time

- Per-application end-to-end latency
- Application response time & transaction time
- Application processing time
- Top conversation per application

Media Performance

- Per-stream jitter and packet loss
- RTP conversations

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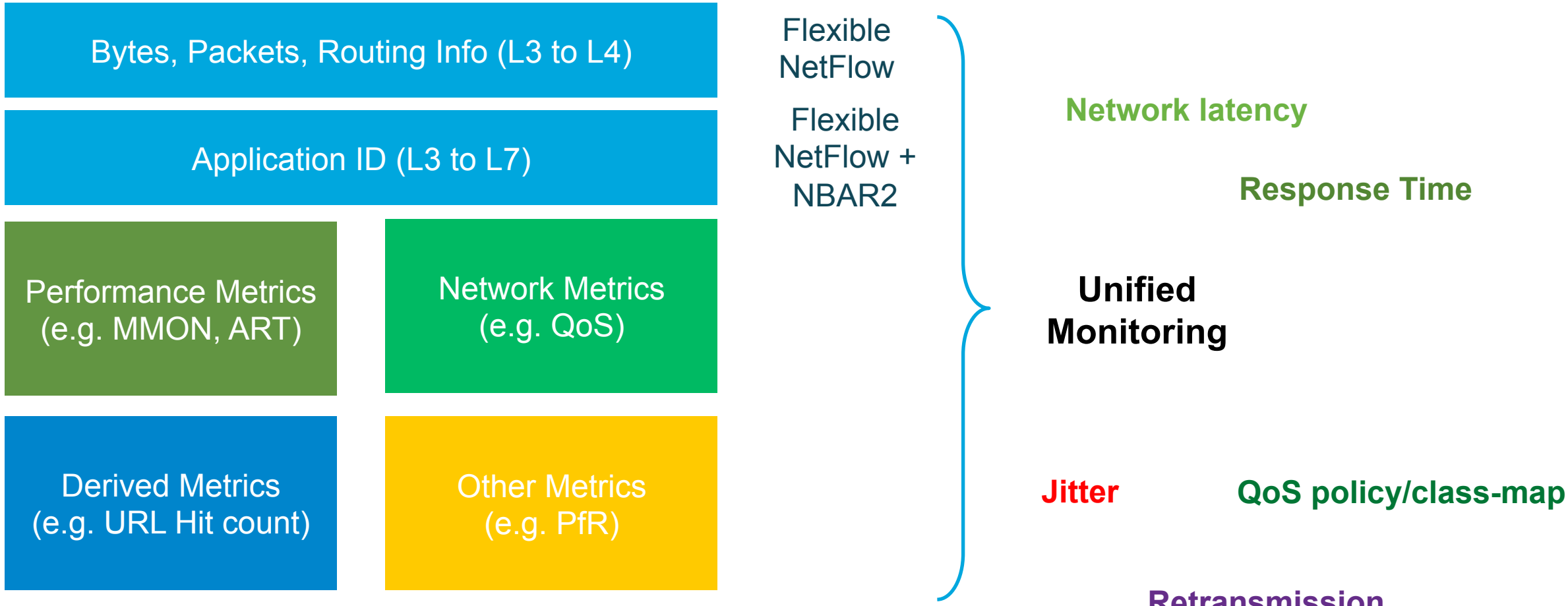
We need more Metrics with Flexible NetFlow



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Unified Monitoring Policy
Example

Policy-driven monitoring – what to monitor, what to collect in single policy

Define Flow Records

```
flow record type performance-monitor rtp-record
 match ipv4 source address
 match ipv4 destination address
 match application name
 collect transport rtp-jitter
 (..)
flow record type performance-monitor art-record
 match ipv4 source address
 match ipv4 destination address
 match application name
 collect art all
 (..)
```

Flow byte-count, interface.
Voice/video RTP metrics, jitter.
App. Response Time, etc.

Define Flow Monitors

```
flow monitor type performance-monitor rtp-mon
 (..)
flow monitor type performance-monitor app-mon
 (..)
```

Filter what traffic to monitor

```
policy-map type performance-monitor avc
 class rtp-traffic
  flow monitor rtp-mon
 class tcp-app
  flow monitor app-mon
 (..)
!
interface Gi0/0/1
 service-policy type performance-monitor input avc
 service-policy type performance-monitor output avc
```

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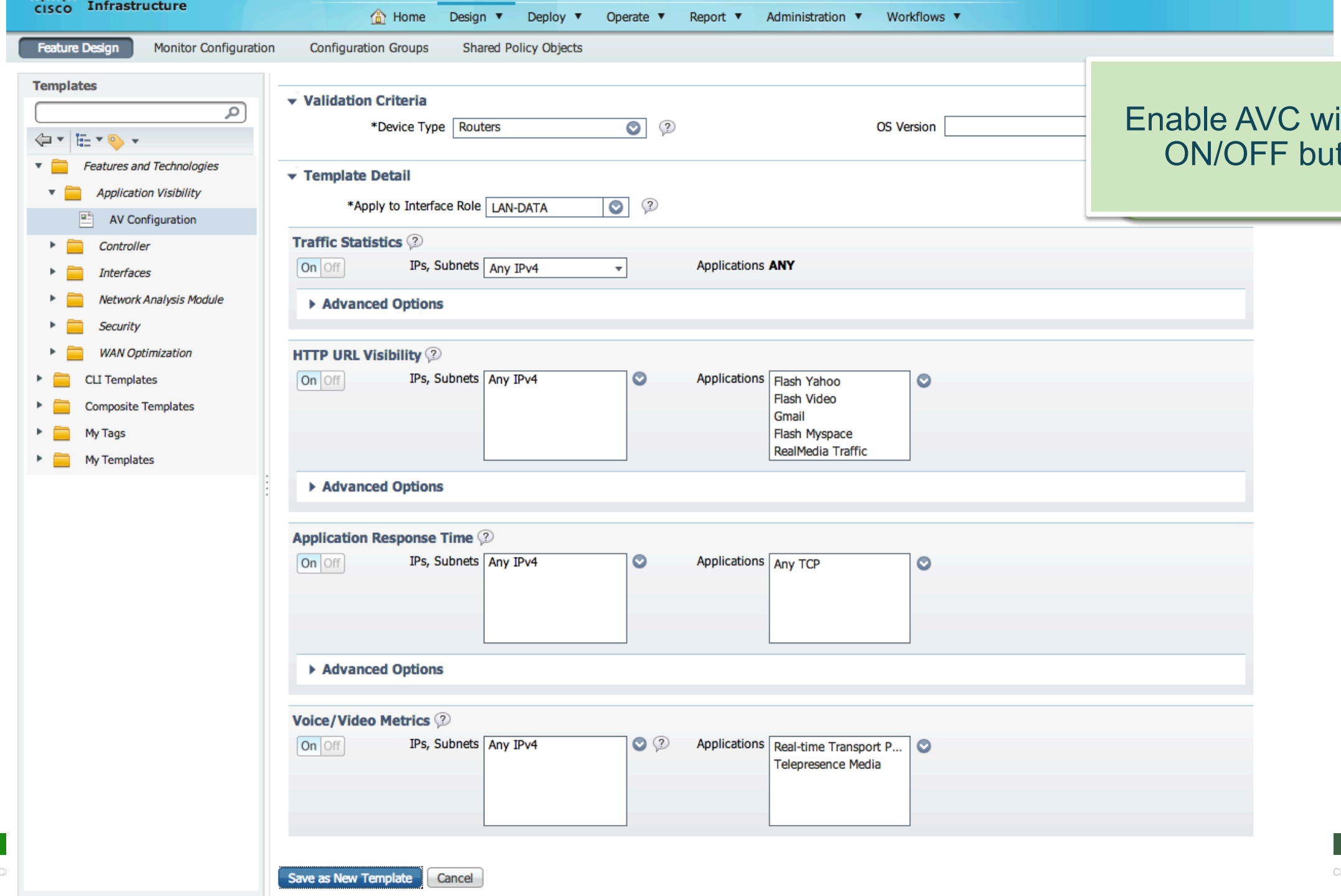

Enable AVC with just ON/OFF button

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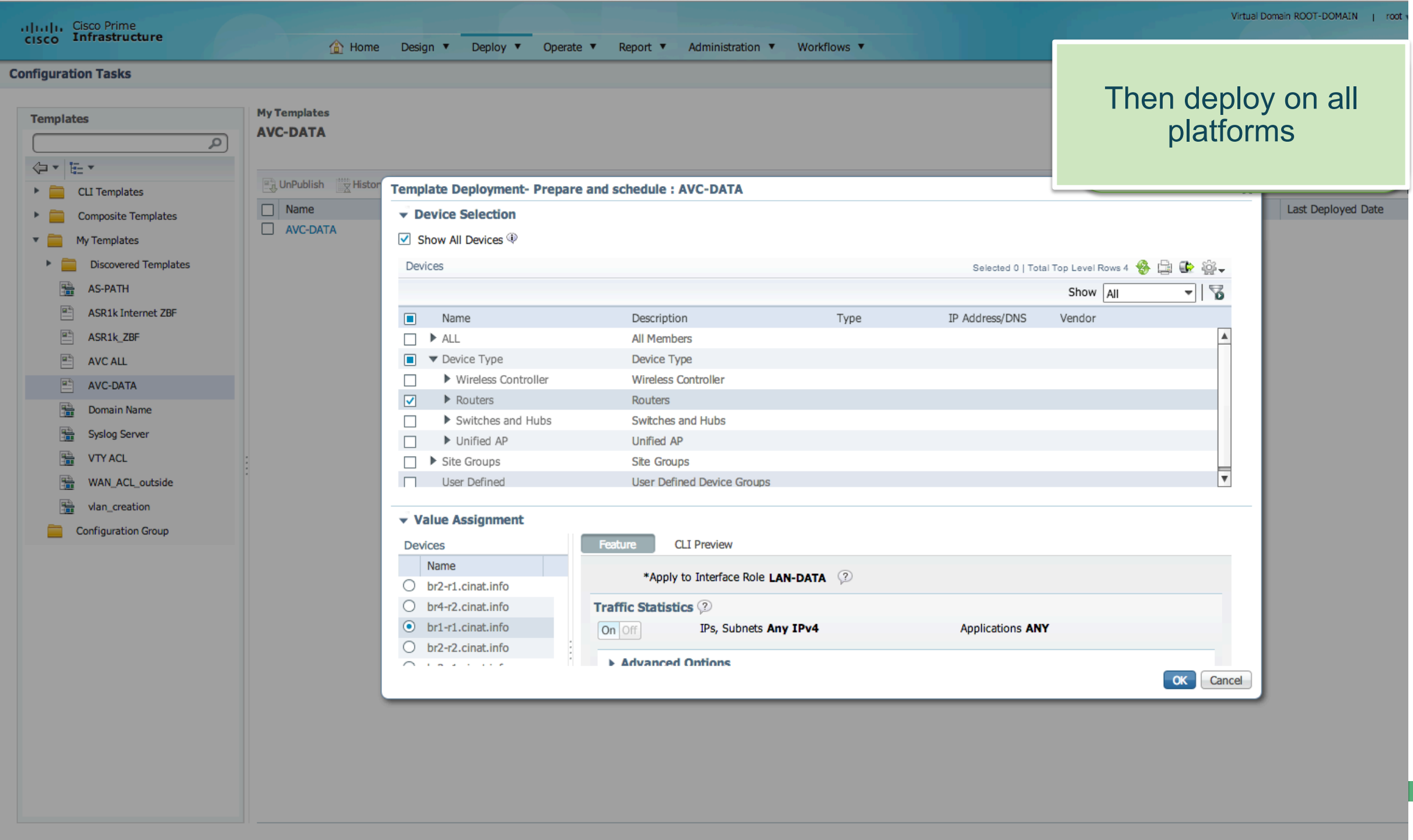
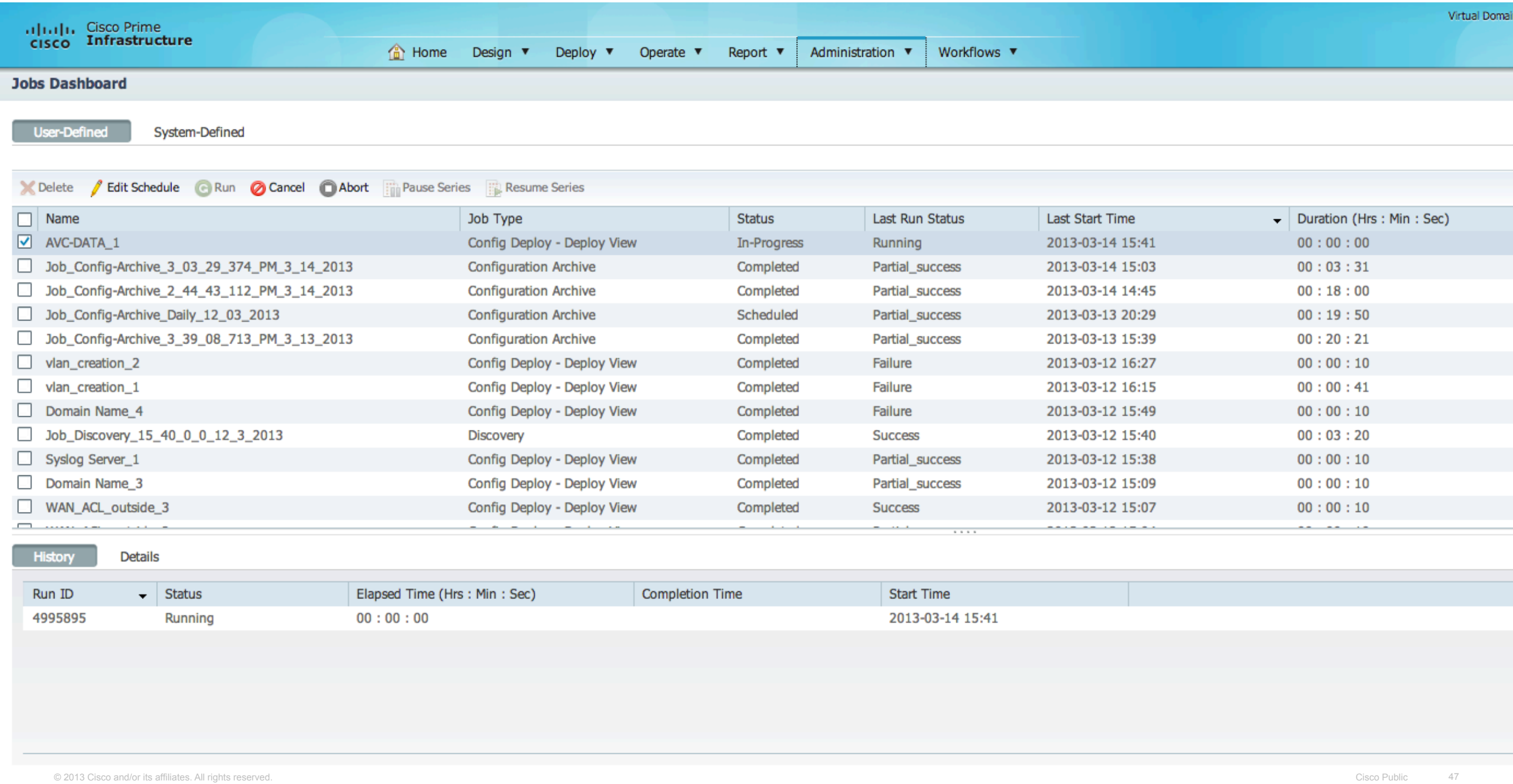


Then deploy on all platforms



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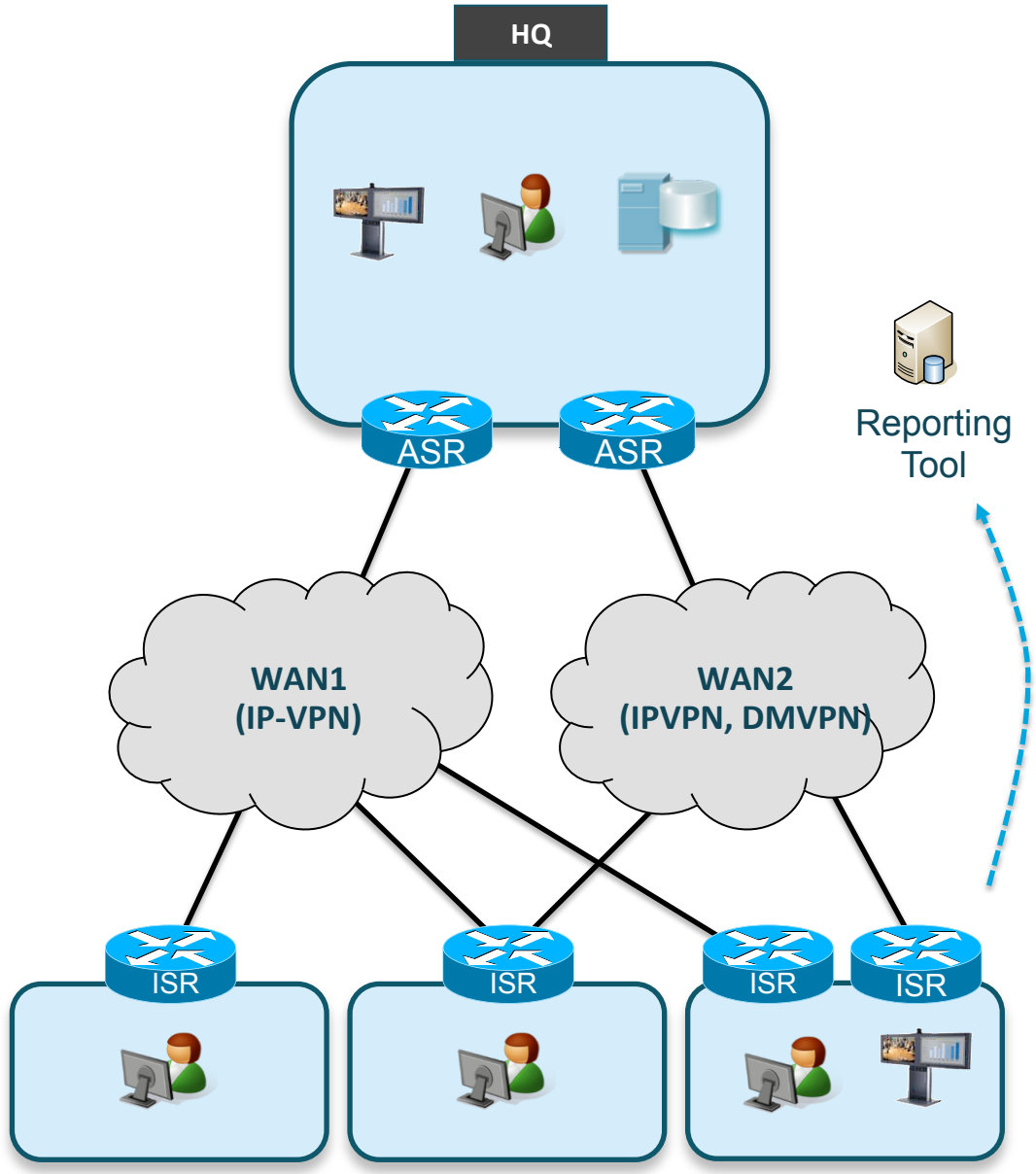
1. Traffic Statistics
Application Usage

Key Features

- Feature to collect and export network information and statistics
- Flexibility in defining fields and flow record format
- Standard FNFv9 or IPFIX export

Benefits

- Visibility into application usage
- Monitors data in Layers 2 thru 7
- Capacity Planning
- Top-N applications
- Top-N clients and servers



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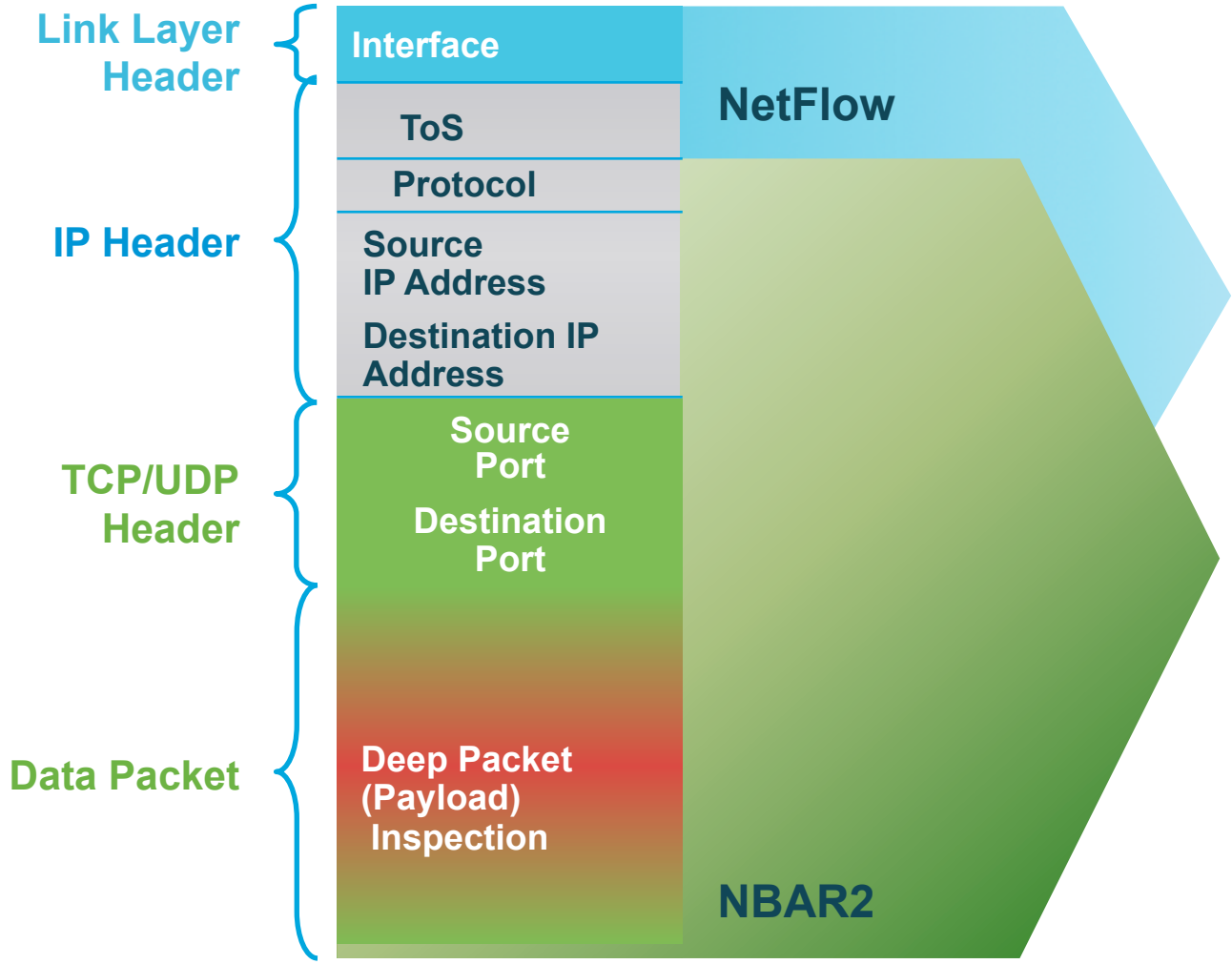
NetFlow and NBAR2 Integration



NetFlow

- ✓ Monitors data in Layers 2 thru 4
- ✓ Determines applications by combination of Port or Port/IP Addressed
- ✓ Flow information who, what, when, where

NBAR

- ✓ Examines data from Layers 3 thru 7
- ✓ Utilizes Layers 3 and 4 plus packet inspection for classification
- ✓ Stateful inspection of dynamic-port traffic
- ✓ Packet and byte counts

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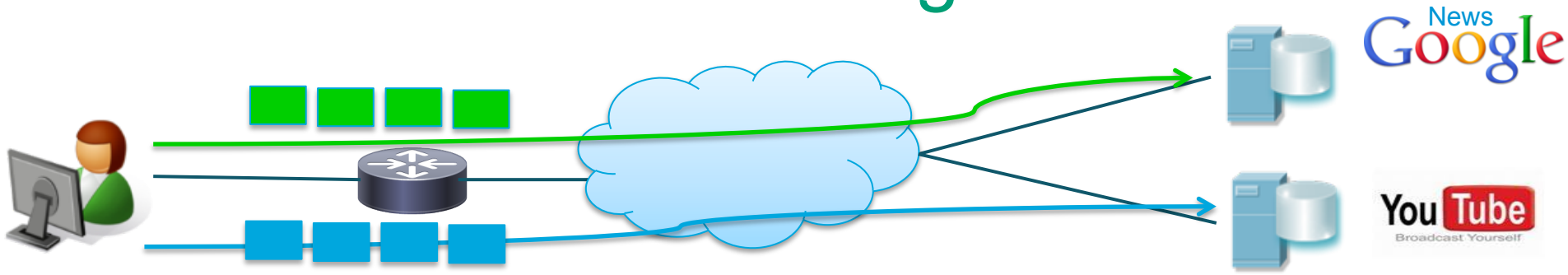
Flexible NetFlow – NBAR2 Integration




```
flow record app_record
  match ipv4 source address
  match ipv4 destination address
  match …..
  match application name
```

Key Fields	Packet #1
Source IP	10.1.1.1
Destination IP	173.194.34.134
Source Port	20457
Destination Port	23
Layer 3 protocol	6
TOS byte	0
Ingres Interface	Ethernet 0

Key Fields	Packet #2
Source IP	10.1.1.1
Destination IP	72.163.4.161
Source Port	30307
Destination Port	80
Layer 3 protocol	6
TOS byte	0
Ingres Interface	Ethernet 0

NetFlow cache

Src. IP	Dest. IP	Src. Port	Dest. Port	Layer 3 Prot.	TOS Byte	Ingress Intf.	App Name	Timestamps	Bytes	Packets
10.1.1.1	173.194.34.134	20457	80	6	0	Ethernet 0	**HTTP**			
10.1.1.1	72.163.4.161	30307	80	6	0	Ethernet 0	**Youtube**			

First packet of a flow will create the Flow entry using the Key Fields" Remaining packets of this flow will only update statistics (bytes, counters, timestamps)

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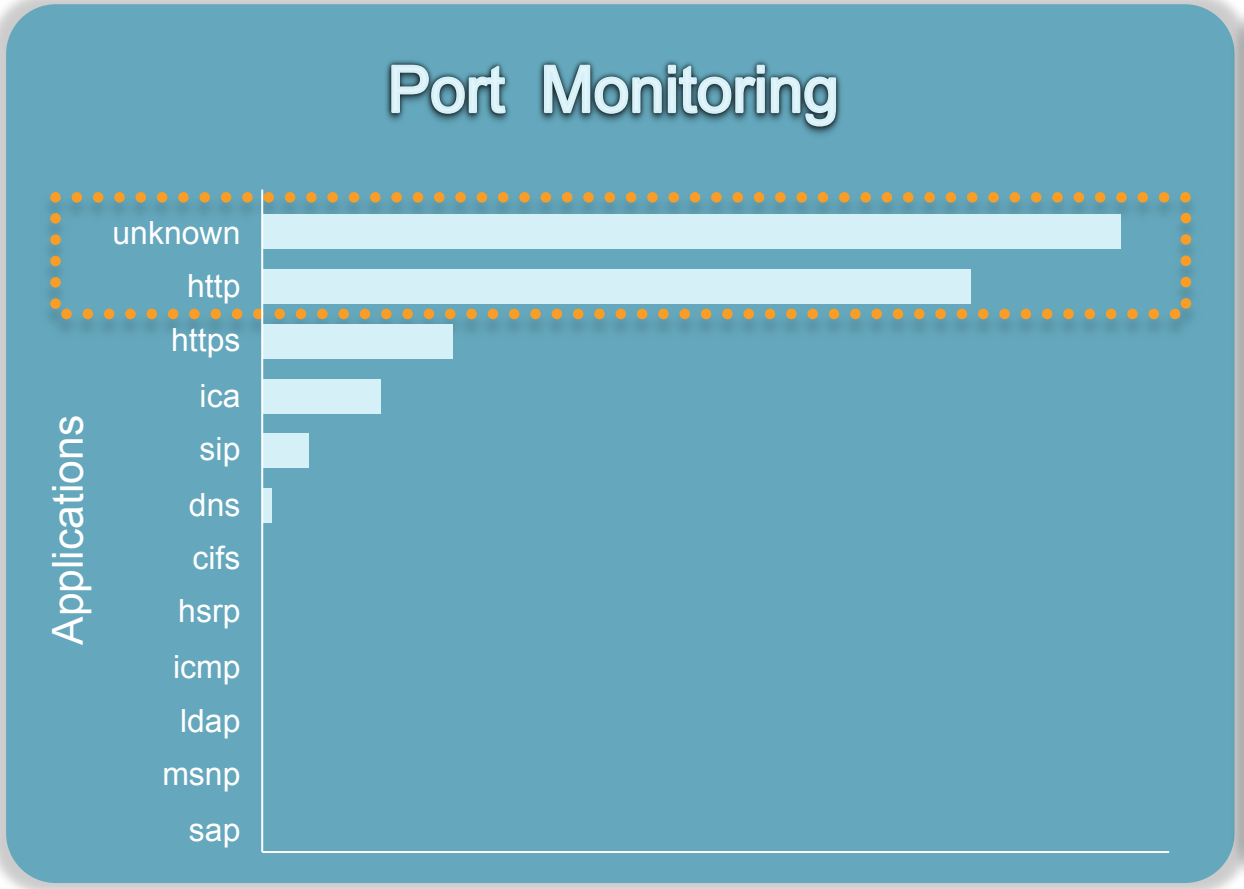
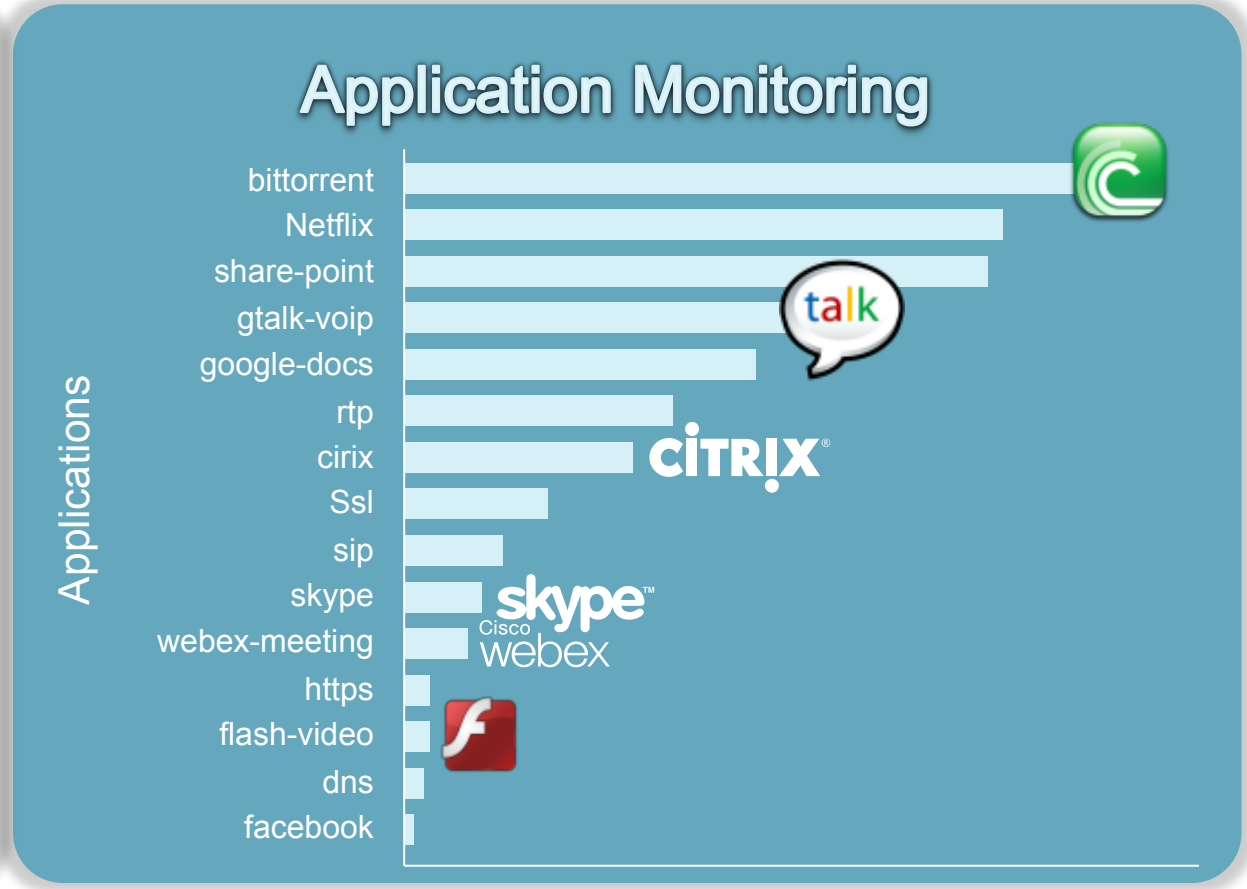
What is Really in Your Network?





Cisco AVC with NBAR2 Provides Deep Packet Inspection at the Application Level

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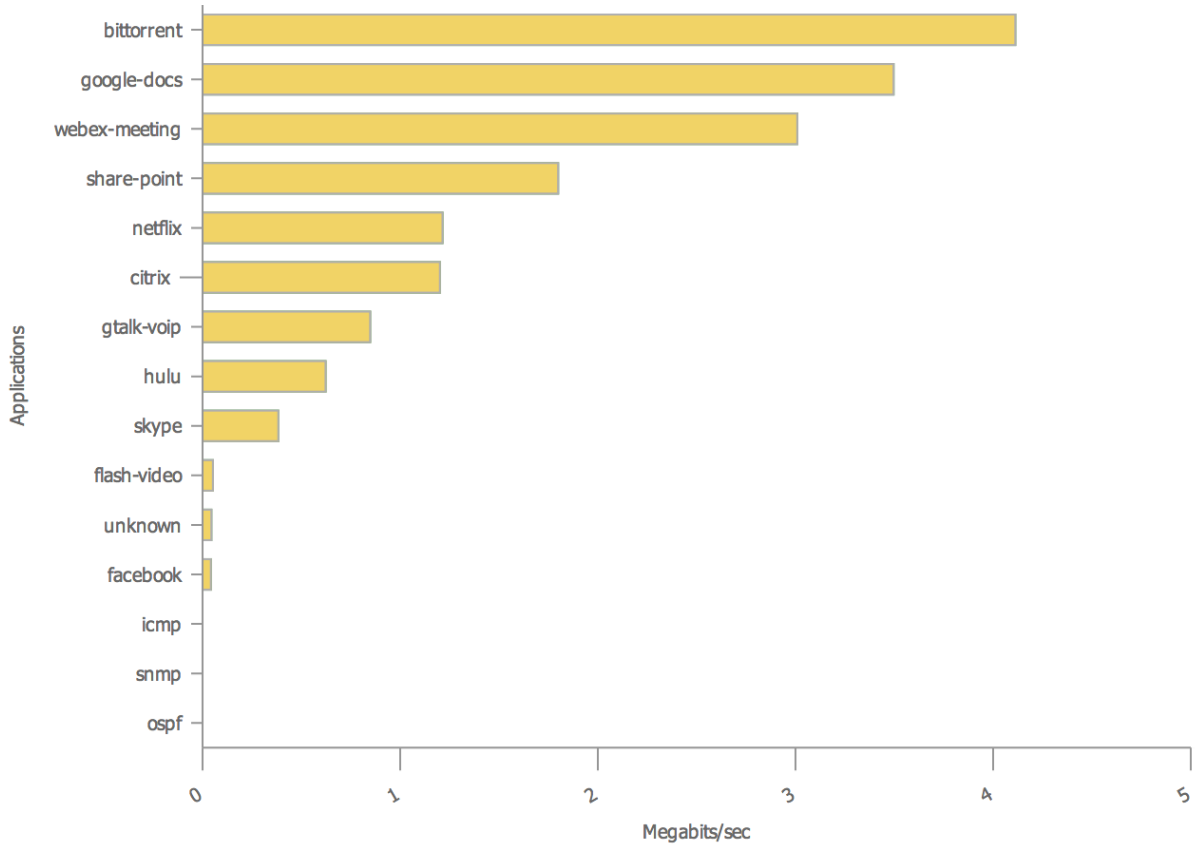
Top N Applications (with AVC)

Edited

Rate | Volume



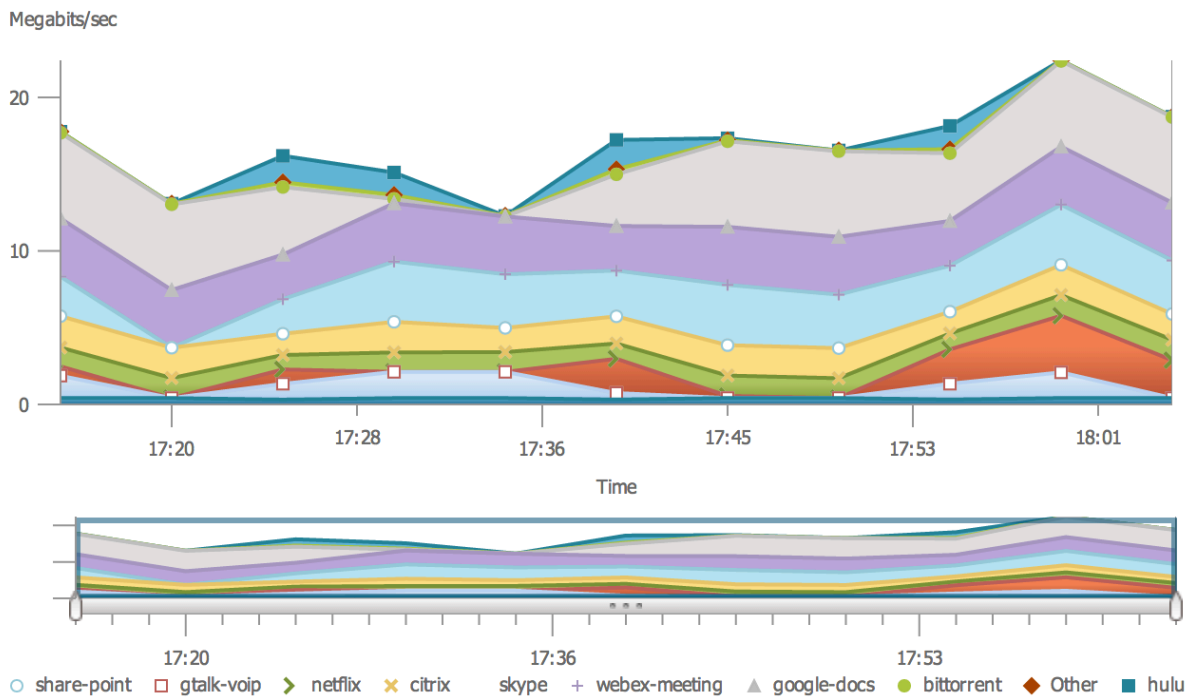
2013 April 02, 18:09:53 CEST

Top Application Traffic Over Time (with AVC)

Edited

Applications | Application Categories

Rate | Volume



2013 April 02, 18:10:04 CEST

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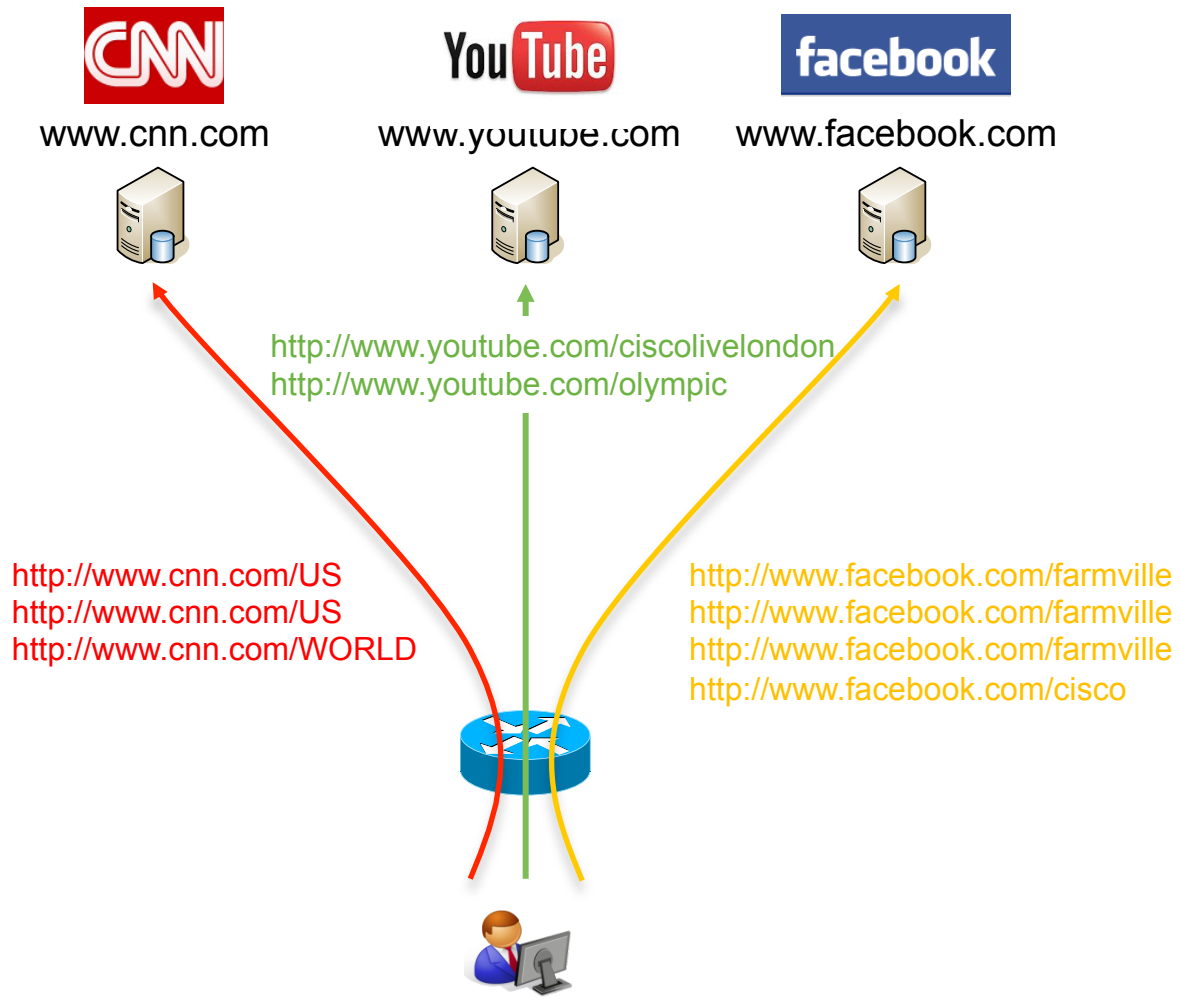
2. URL Collection
Top Domain, hit counts

Key Features

- Provide web browsing activity report
- Utilize IPFIX Format which is extensible
- Standard IPFIX export

Benefits

- Visibility into top domains
- Monitors data in Layers 2 thru 7
- Most visited web site
- Most visited URL per site
- How many hits for a particular domain – extracted from HTTP request message



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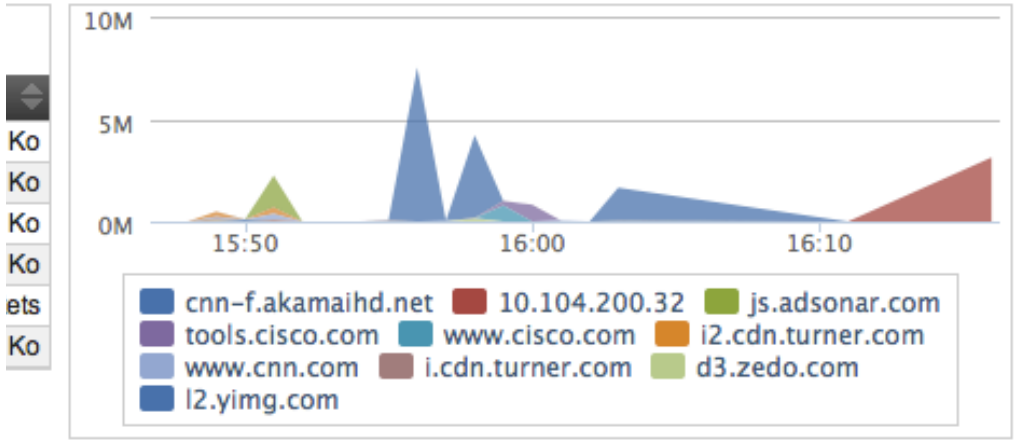
URL Monitoring
Top Domain and URL Hit Count Report

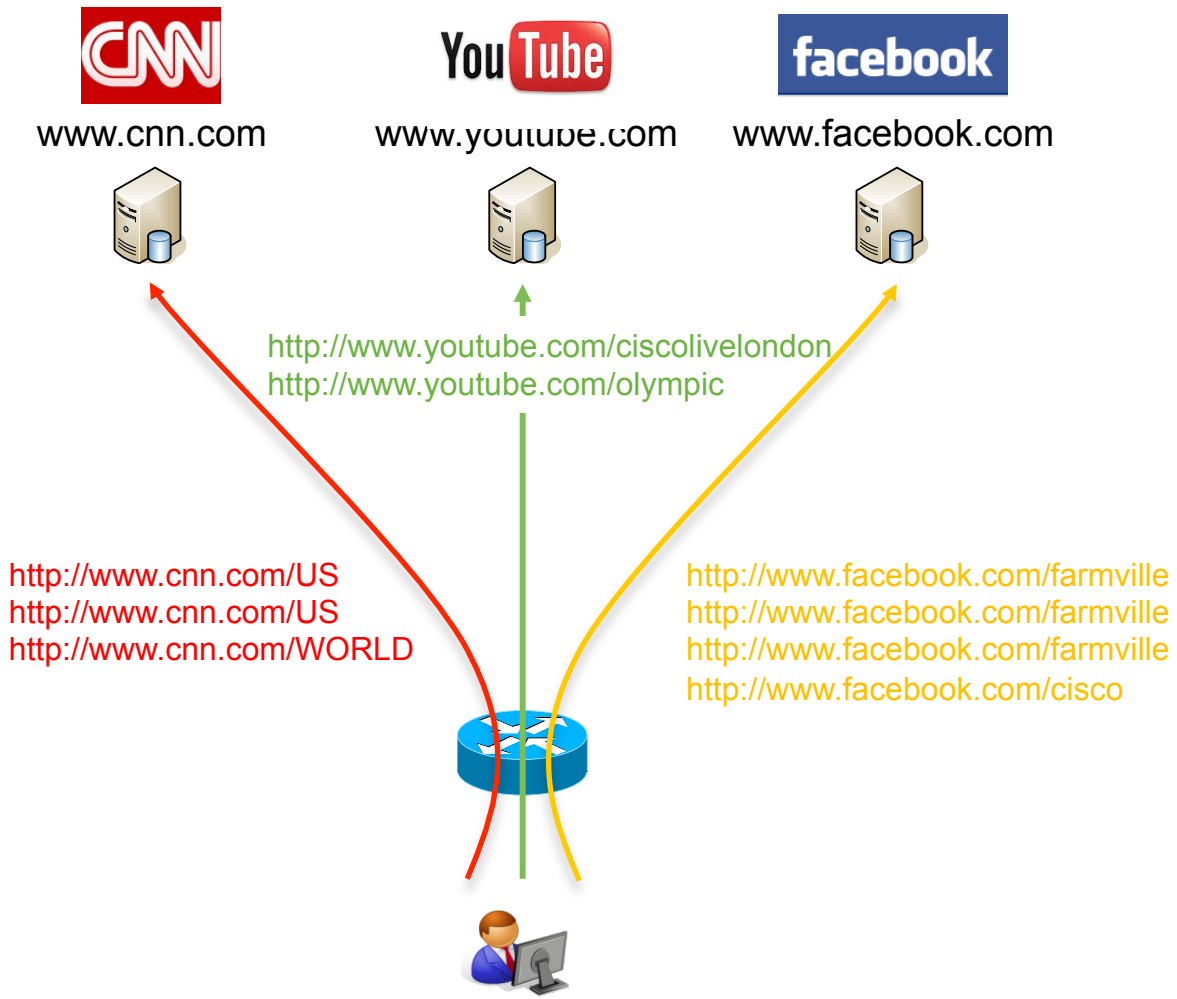
Trafic par hostname

1 - 6 on 116 | 1 | 2 | 3 | 4 | 5 | 6 | 10 | 20

Hits	Hostname	Entrant	Sortant
17	www.cnn.com	546.46 Ko	109.23 Ko
15	ads.cnn.com	54.87 Ko	78.97 Ko
12	i.cdn.turner.com	251.56 Ko	23.64 Ko
12	mi.adinterax.com	608 Octets	1.92 Ko
12	cdn.ndtv.com	-	480 Octets
11	d3.zedo.com	176.28 Ko	37.94 Ko

Trafic entrant par hostname





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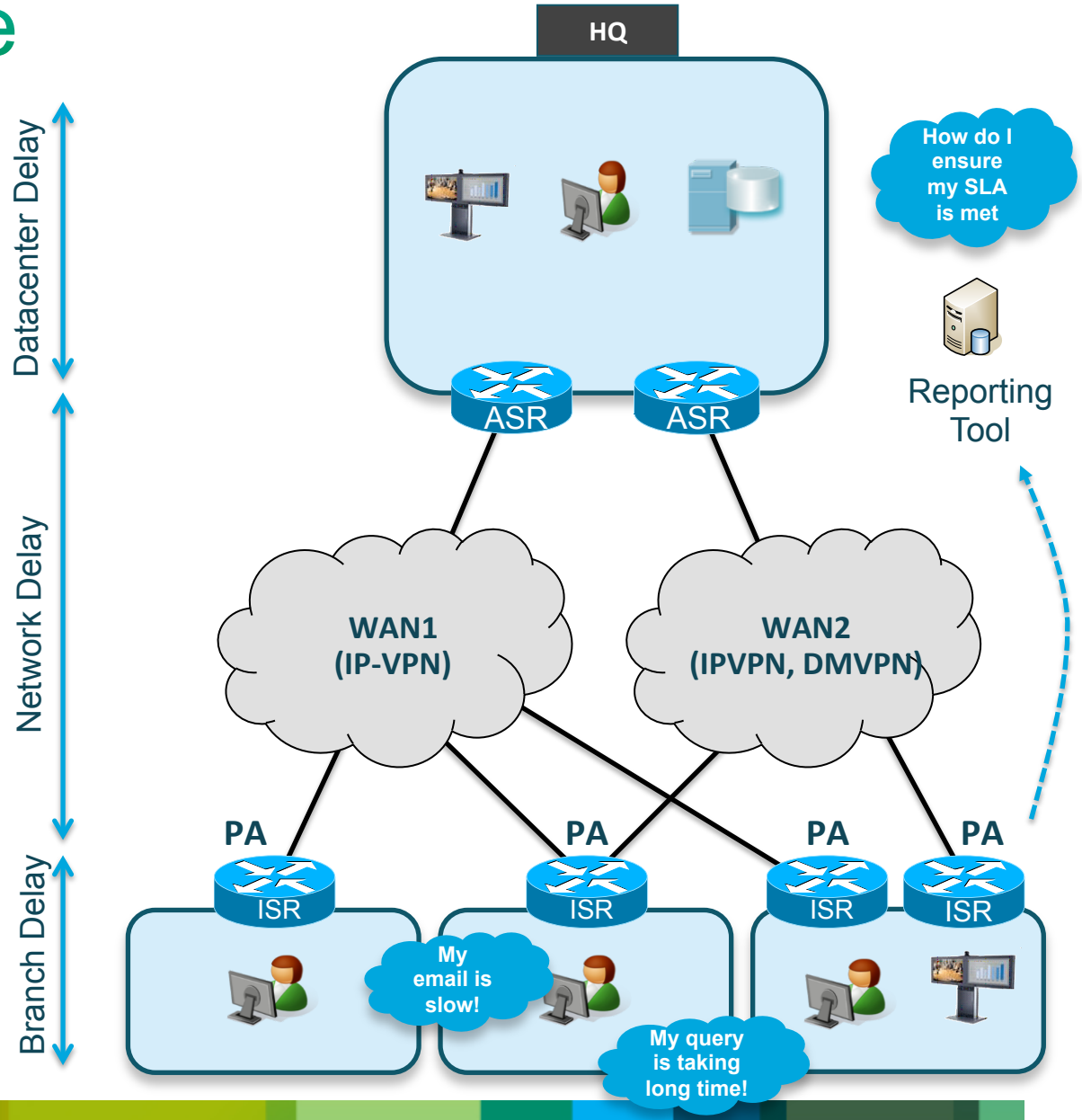
3. Application Response Time
Measurement

Key Features

- 27 Application Response Time (ART) Metrics
- Interact with NBAR2 for Application ID
- Standard NFv9 and IPFIX export

Benefits

- Visibility into application usage and performance
- Quantify user experience
- Troubleshoot application performance
- Track service levels for application delivery



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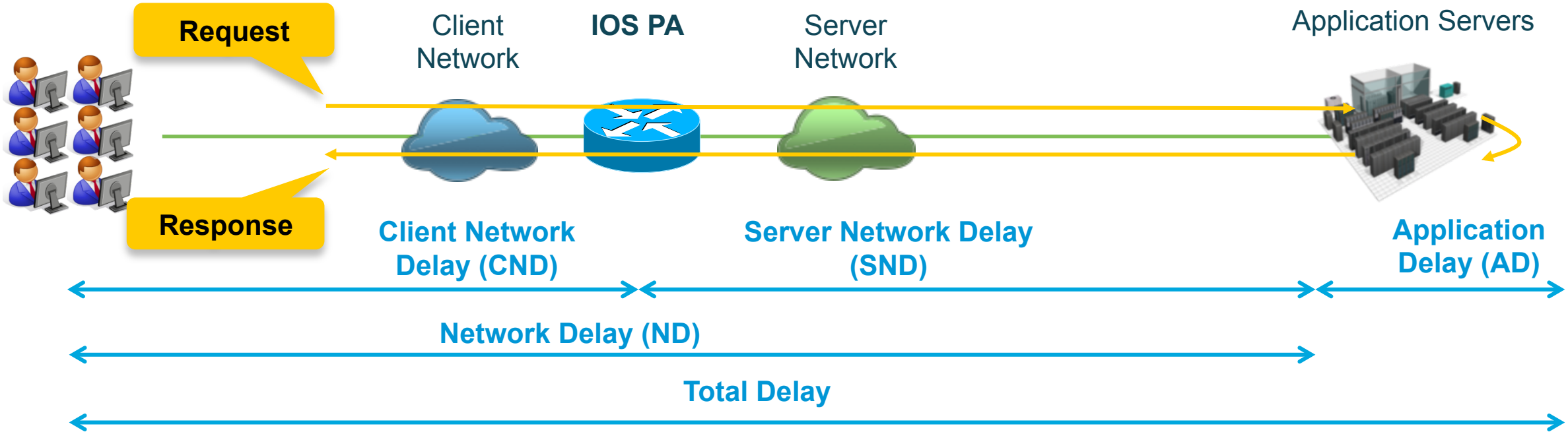
Application Response Time
Network Path Segments



- Application response time provides insight into application behavior (network vs server bottleneck) to accelerate problem isolation
- Separate application delivery path into multiple segments
- Server Network Delay (SND) approximates WAN Delay
- Latency per application

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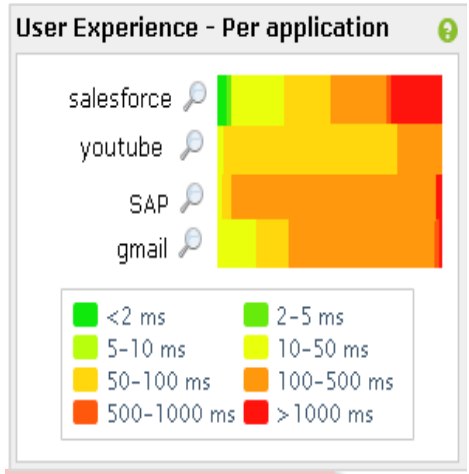
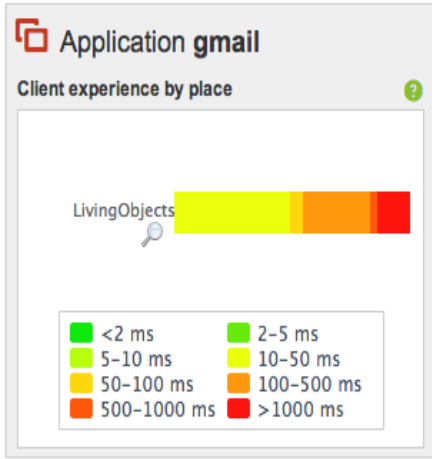
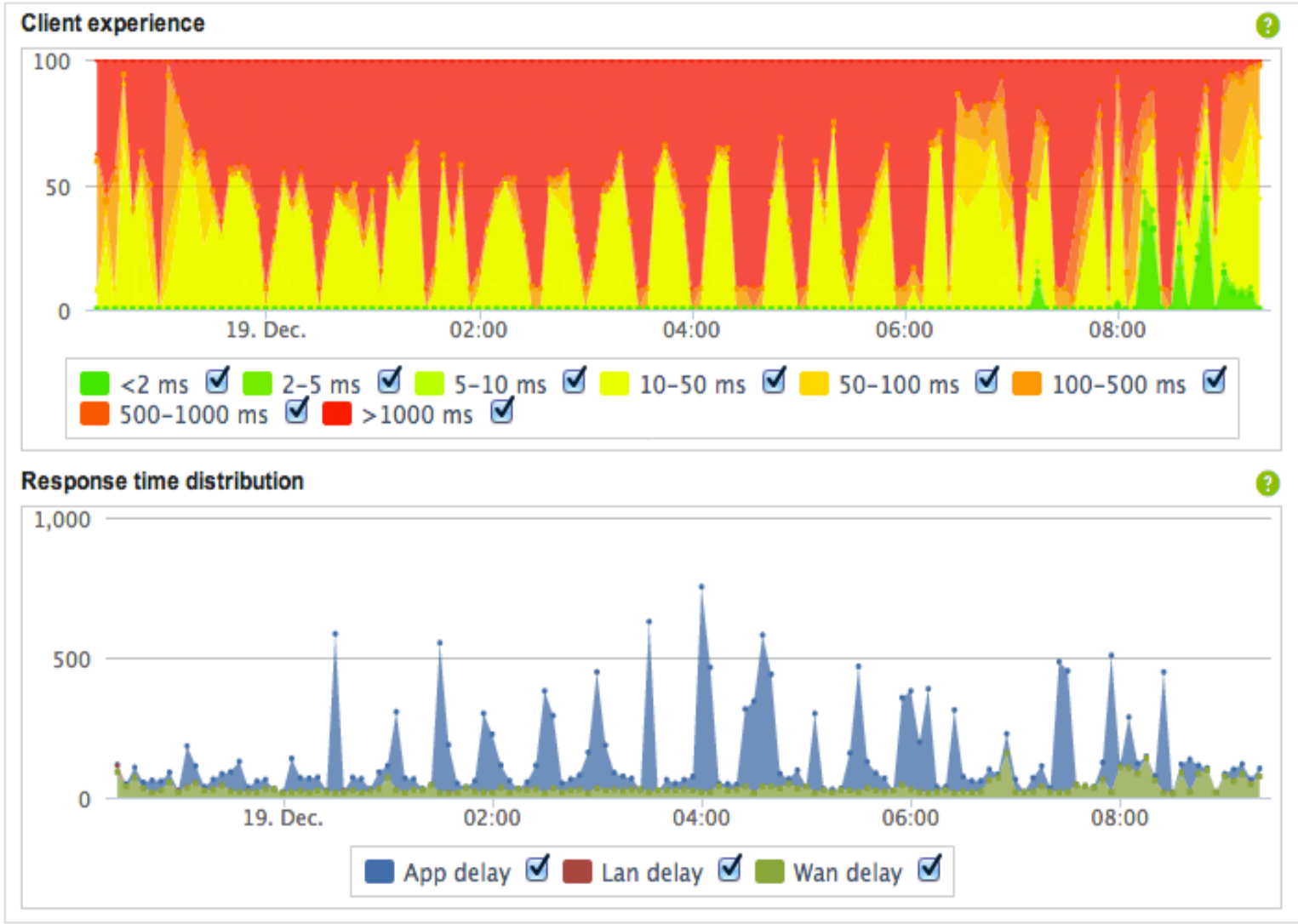
Application Response Time
Measurement







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https://10.9.2.1/webacs/loginAction.do?action=login&flashVersion=9.0.124.0&hasCorrectFlashVersion=true&product=wcs#pa

Cisco Internal | perso | Medianet | AVC | IWE | Cisco Europe | Visibility | Employee Landi... | Directory

Cisco Prime Infrastructure – My...

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | root

Home | Design | Deploy | Operate | Report | Administration | Workflows

Overview | Incidents | Performance | Detail Dashboards

Site | Device | Interface | Application | Voice/Video | End User Experience | WAN Optimization | AVC Stats | AVC Perf | AVC URLs | test

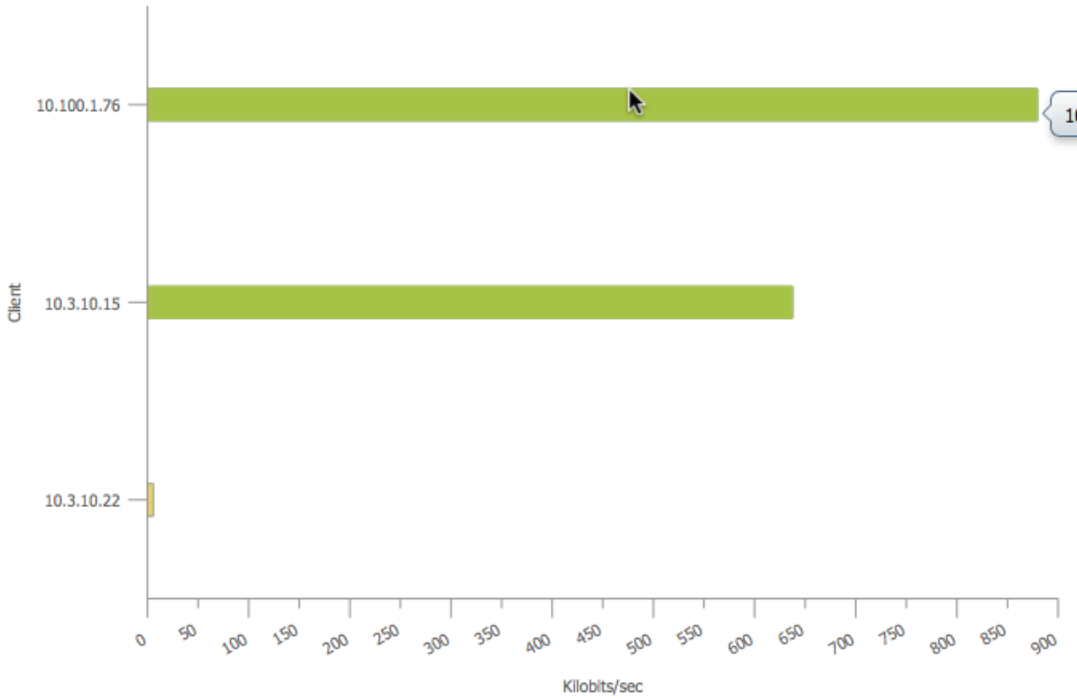
Filters *Application: exchange | *Time Frame: Past 6 Hours | Network Aware | Site: All | Go

Top N Clients

Edited

Client | User

Rate | Volume

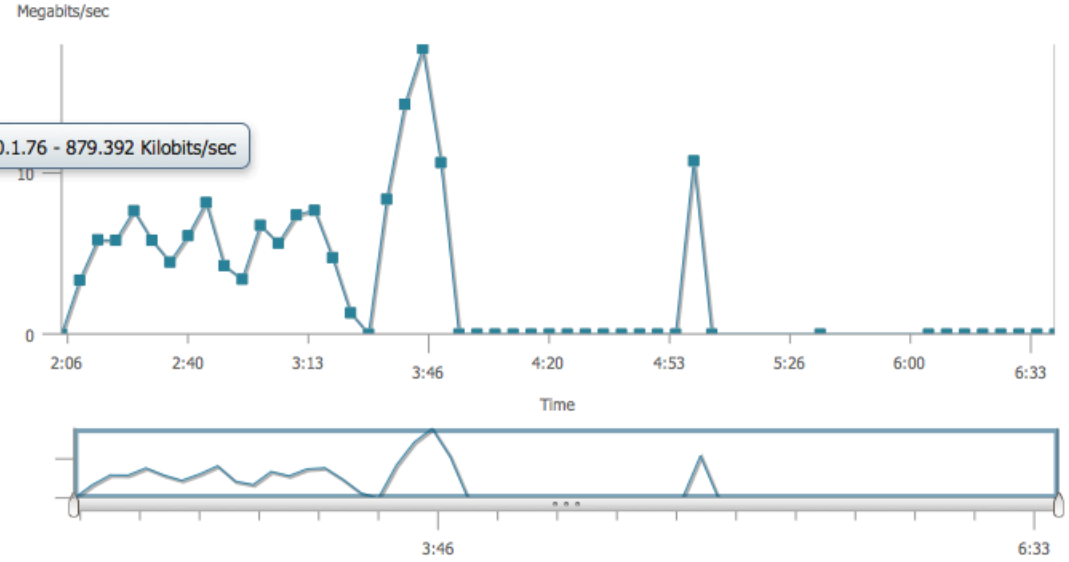


Traffic | Wireless | Wired

2013 March 19, 14:00:23 UTC

Application Traffic Analysis

Rate | Volume



2013 March 19, 14:00:26 UTC

Application Server Performance

Application Server	Site	Application	Avg. Server Response Time (ms)	Max. Server Response Time (ms)	Analysis
10.9.2.9	Datacenter	exchange	59	168	

Workflow Status 0 0 0 | Support Cases | Alarm Browser | Alarm Summary 16 1 142

https://10.9.2.1/webacs/loginAction.do?action=login&flashVersion=9.0.124.0&hasCorrectFlashVersion=true&product=wcs#pa

Cisco Internal | perso | Medianet | AVC | IWE | Cisco Europe | Visibility | Employee Landi... | Directory

Cisco Prime Infrastructure – My...

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | root

Home | Design | Deploy | Operate | Report | Administration | Workflows

Overview | Incidents | Performance | Detail Dashboards

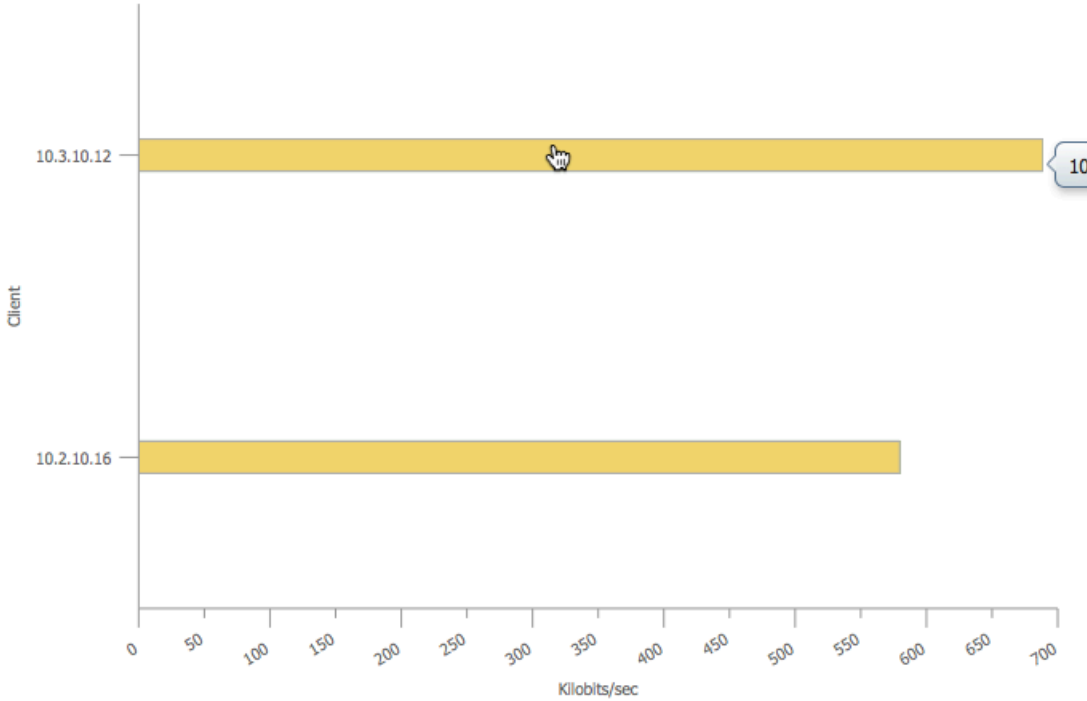
Filters | *Application: youtube | *Time Frame: Past 6 Hours | Network Aware | Site: All | Go

Top N Clients

Edited

Client | User

Rate | Volume

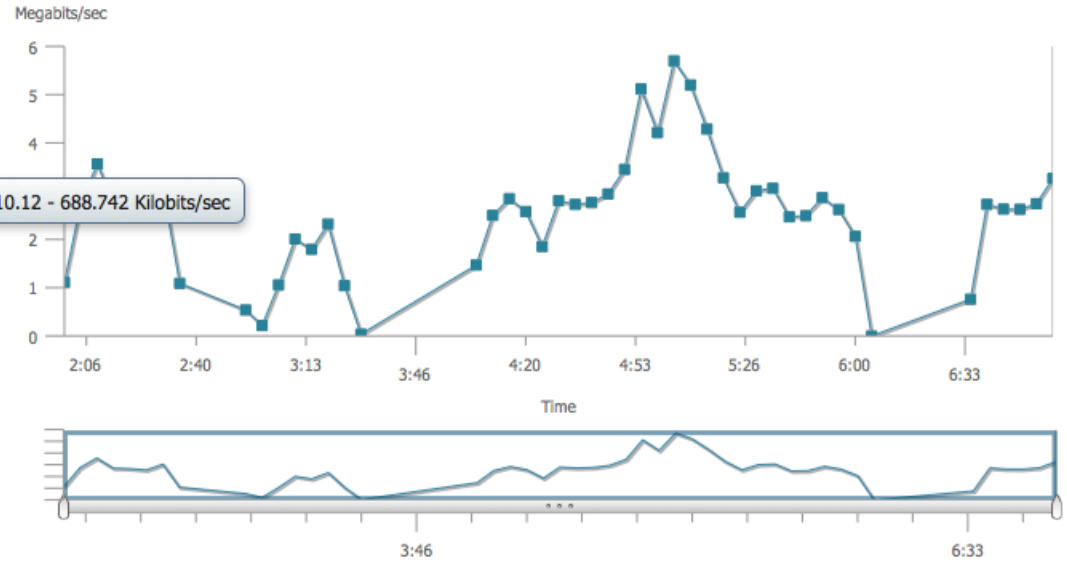


Traffic | Wireless | Wired

2013 March 19, 14:03:06 UTC

Application Traffic Analysis

Rate | Volume



2013 March 19, 14:03:08 UTC

Application Server Performance

Application Server	Site	Application	Avg. Server Response Time (ms)	Max. Server Response Time (ms)	Analysis
74.125.224.39	Unassigned	youtube	67	109	
74.125.170.147	Unassigned	youtube	45	85	
74.125.224.37	Unassigned	youtube	35	84	
74.125.170.110	Unassigned	youtube	74	74	

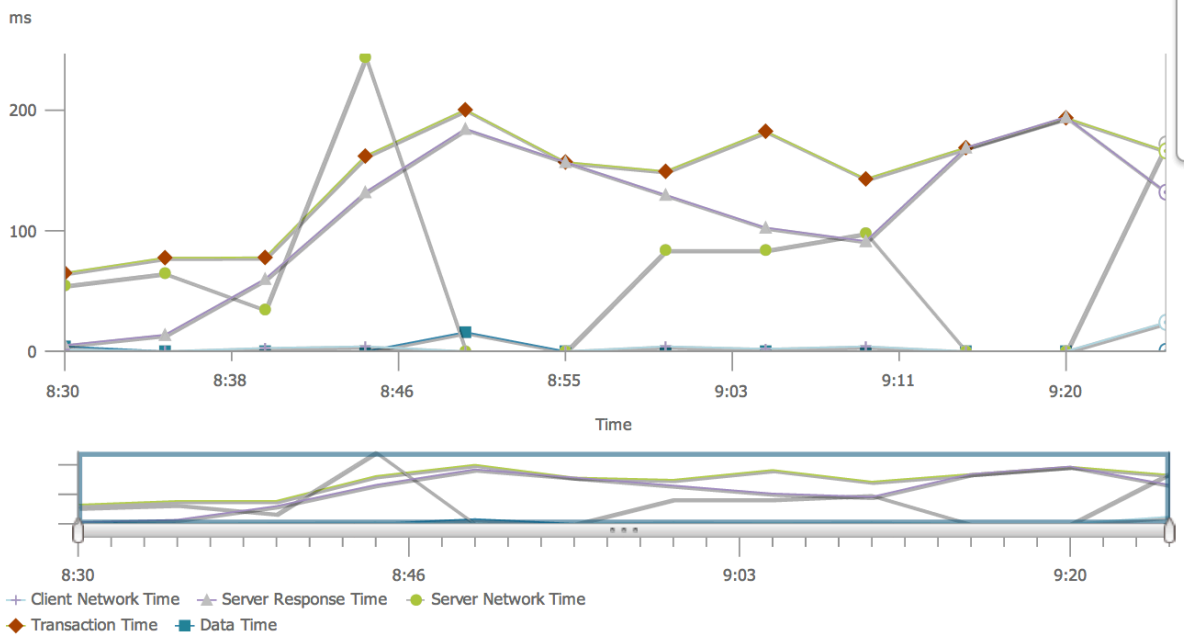
Top N Servers

Workflow Status 0 0 0 | Support Cases | Alarm Browser | **Alarm Summary** 16 1 142

Filters Application http Site Branch3 Go

Application ART Analysis

Edited



2013 March 19, 16:29:27 UTC

Time: 09:25:00 3/19/2013 (PDT)
Value(s) are ms
Client Network Time: 24
Server Response Time: 132
Server Network Time: 172
Transaction Time: 166.22
Data Time: 0

Clients by ART Metrics

Edited

Selected Metric : Transaction Time

User	Application	Maximum Transacti...	Average Transactio...	Art Analysis
	http	176	176	Show Analysis
	http	193	146	Show Analysis
	http	258	46	Show Analysis
	http	184	15	Show Analysis
	http	0	0	Show Analysis

2013 March 19, 16:29:27 UTC

Worst N Sites by ART Metrics

Edited

Selected Metric : Transaction Time

Site	Application	Maximum Transaction Time (ms)	Average Transaction Time (ms)
Datacenter	http	55705	22479
Unassigned	http	55705	6344
Branch1	http	9202	1957
Branch4	http	5572	1532
Branch5	http	6938	585

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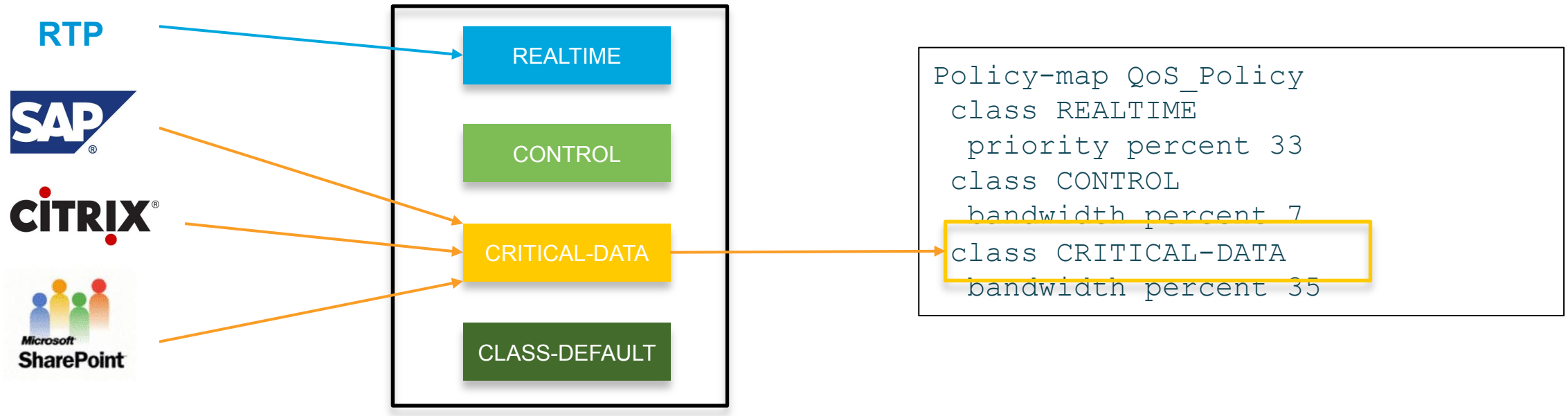
QoS Visibility
Overview

- Accurately report application class of service
  - Which QoS class my WebEx application falls into
- Correlate application performance problem with network congestion
  - How many queue drops do I have for my SAP application



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4. Media Monitoring
Monitor Voice and Video Performance

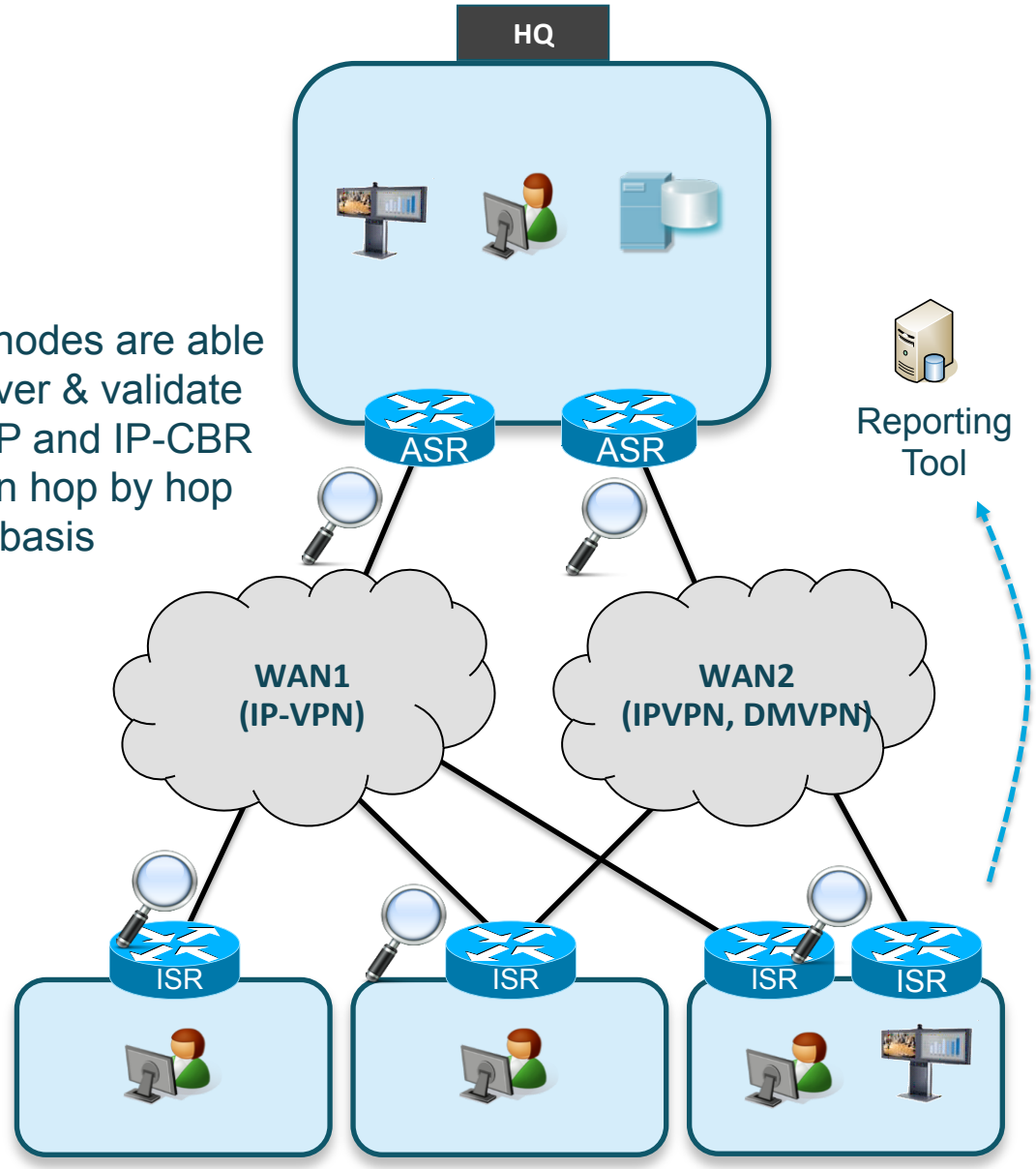
Key Features

- Monitor media performance metrics, i.e. jitter, loss
- Integrate with NBAR2 to identify applications
- Setting threshold and generating alert/alarm
- Standard FNFv9 or IPFIX export

Benefits

- Real-time monitoring of voice and video performance across network
- Accelerate troubleshooting – identify what, where, when is the problem
- Proactive troubleshooting
- Validate SLA

Network nodes are able to discover & validate RTP, TCP and IP-CBR traffic on hop by hop basis



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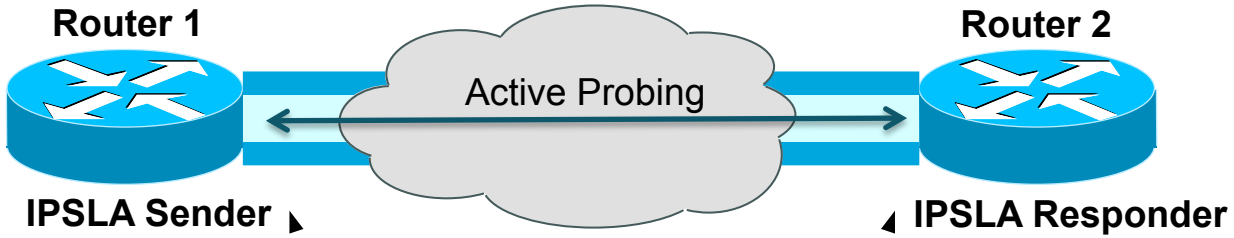
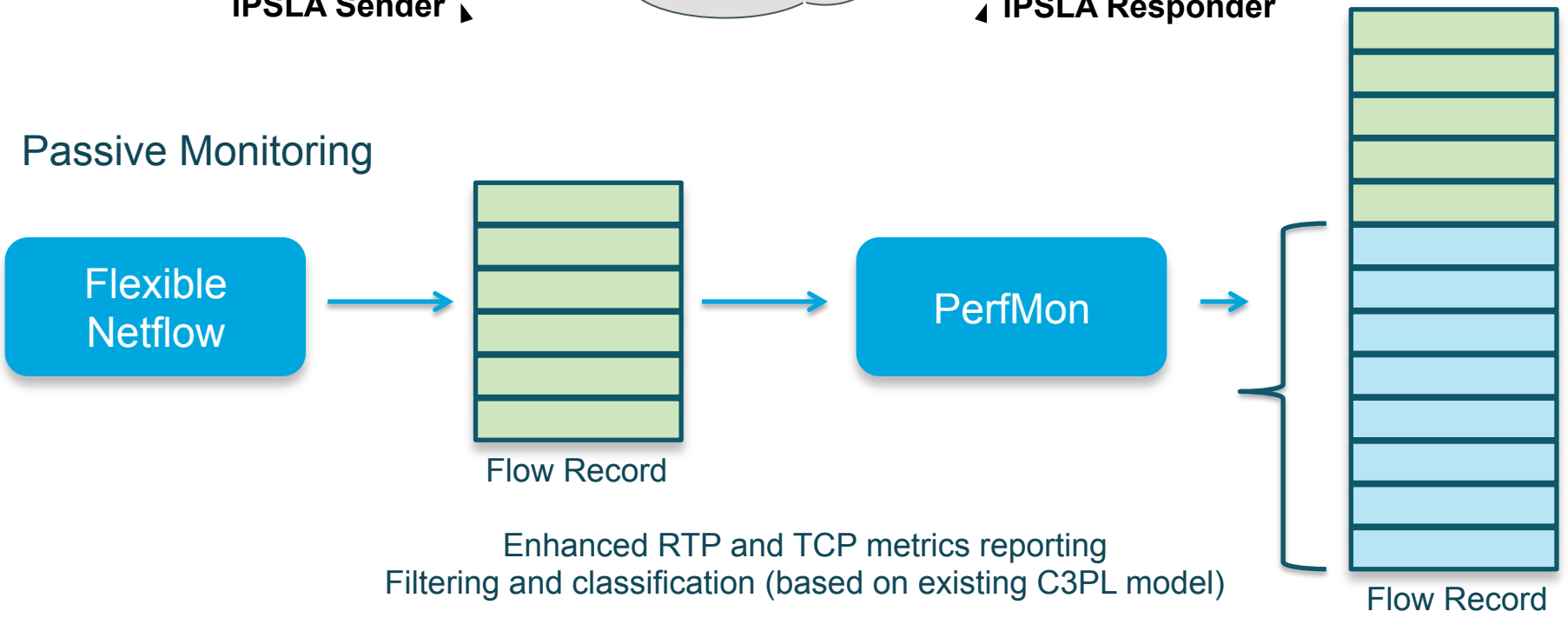
Performance Monitor
Position vs FNF and IP SLA

Active Monitoring



Passive Monitoring



Enhanced RTP and TCP metrics reporting
Filtering and classification (based on existing C3PL model)

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Control
Hierarchical QoS and PfR

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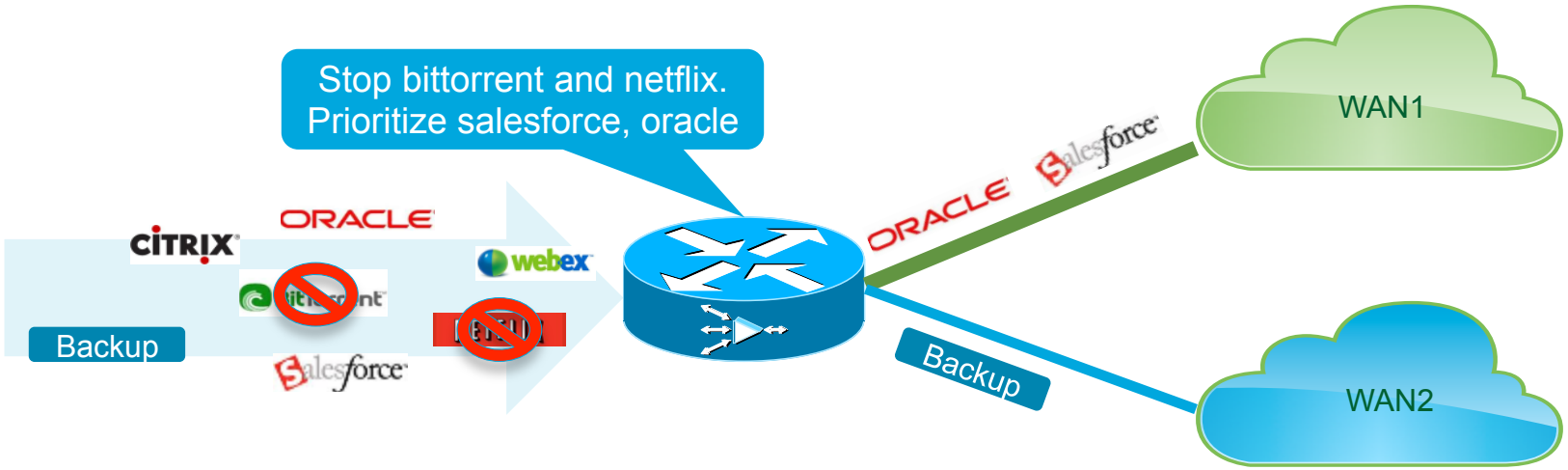
Maximize Application Performance

Controls application bandwidth usage and selects optimal path



Application-aware QoS

Identify 1000+ applications using NBAR2 and control bandwidth with Cisco industry leading QoS

Limit unwanted traffic and prioritize critical applications

Intelligent Path Selection

Deliver critical applications over the path which can meet application performance requirement using PfR

Automatic load share to maximize bandwidth use on available links

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Modular QoS Traffic Classification
NBAR2 Integration – IPv4 and IPv6

- Statefull classification for creating policies irrespective of v4/v6 traffic, simplifying policy management
- Discover applications using NBAR2
- Supports both input and output traffic

What Traffic?

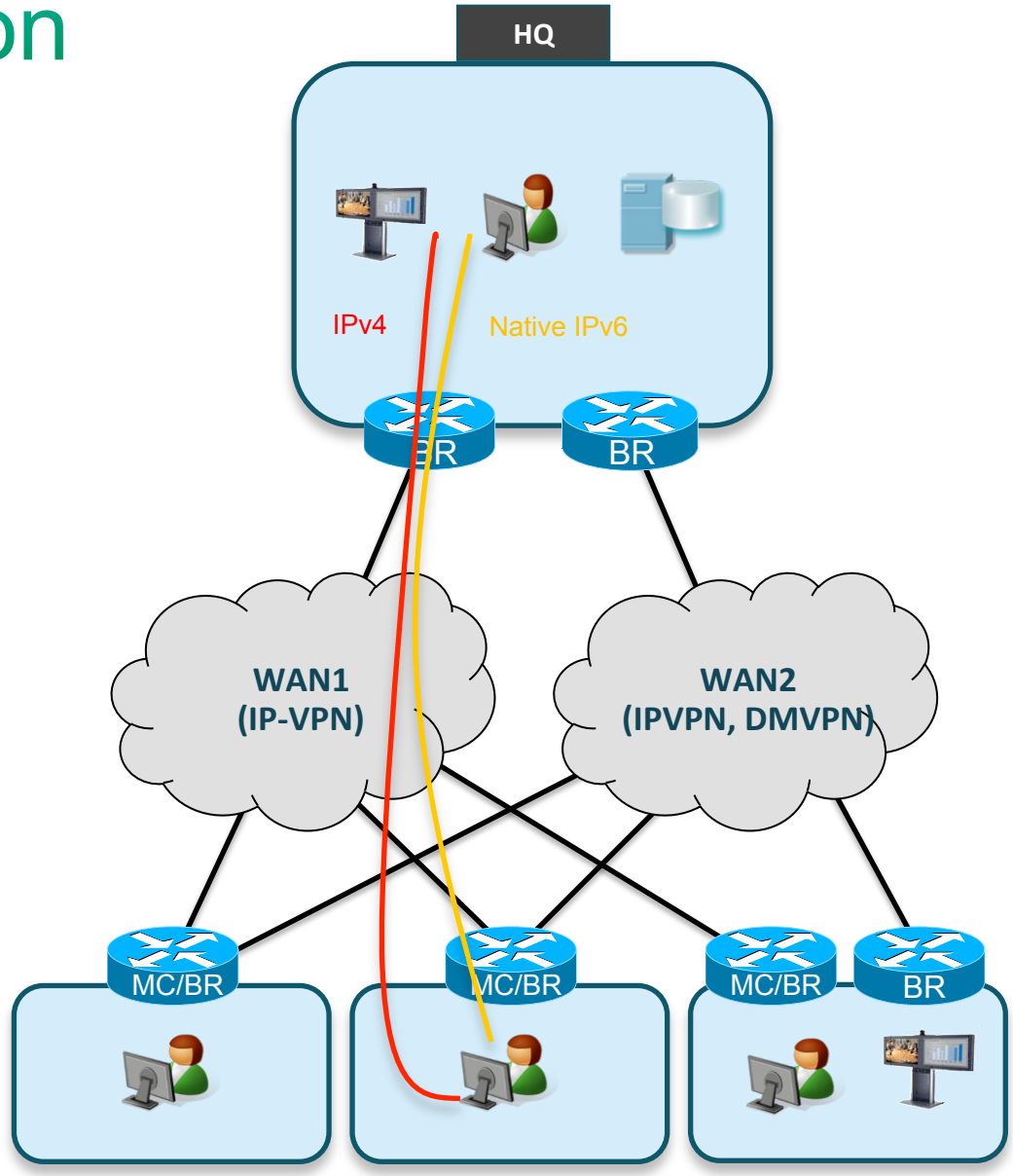
```
class-map match-any peer2peer
  match protocol kazaa2
  match protocol gnutella
  match protocol fastrack
```

HOW to treat the traffic?

```
policy-map limit-p2p
  class peer2peer
  bandwidth percent 10
```

Where to apply?

```
interface Serial1
  service-policy input limit-p2p
```



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Modular QoS Traffic Classification
Simplified Policies using NBAR2 Attributes

- Discover applications using NBAR2
- Category, sub-category, device-type …

What Traffic?

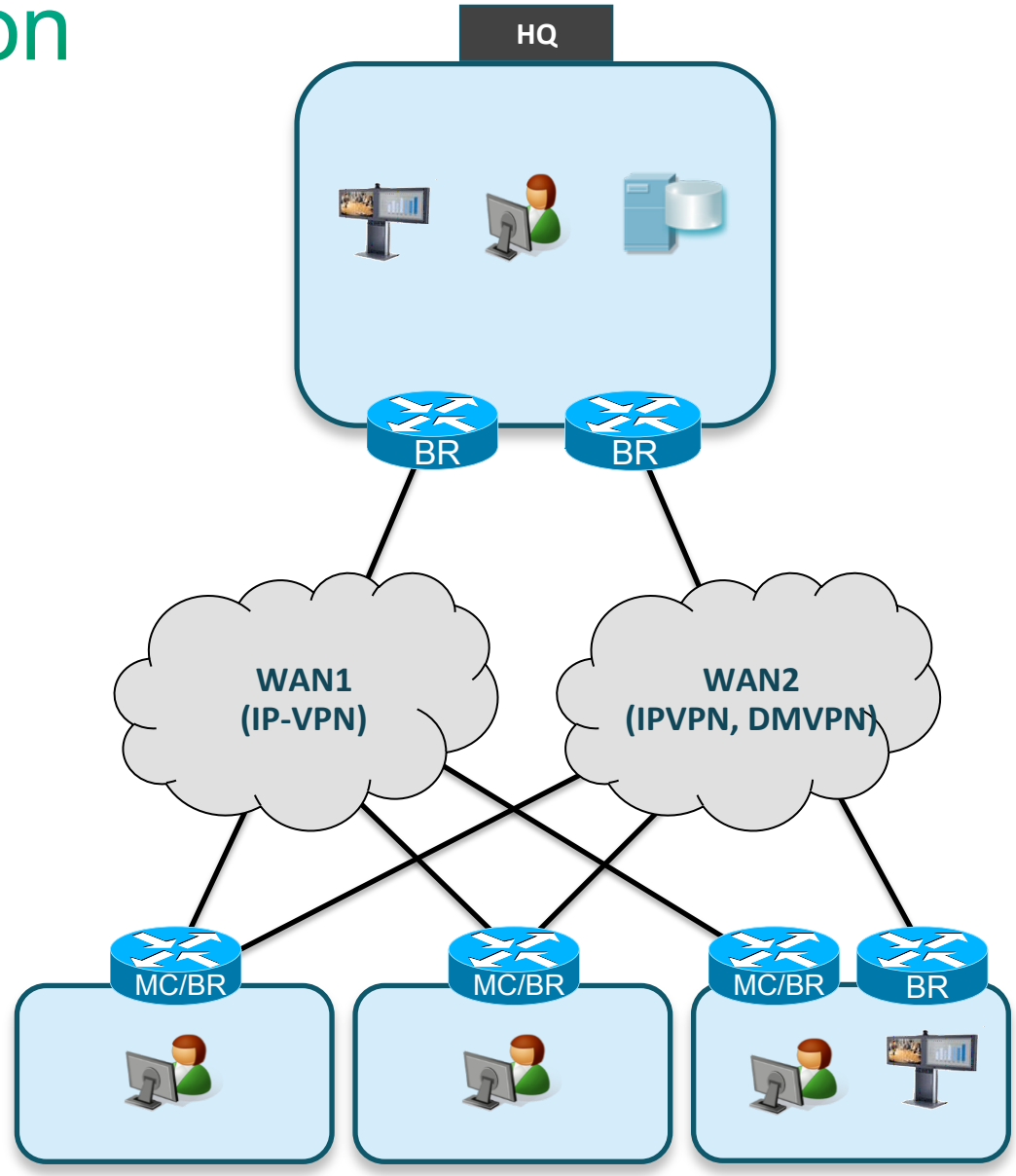
```
class-map my-class
 match protocol attribute category filesharing
```

HOW to treat the traffic?

```
policy-map limit-p2p
  class peer2peer
  bandwidth percent 10
```

Where to apply?

```
interface Serial1
  service-policy input limit-p2p
```



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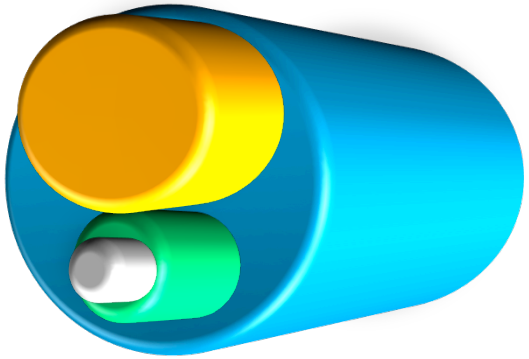
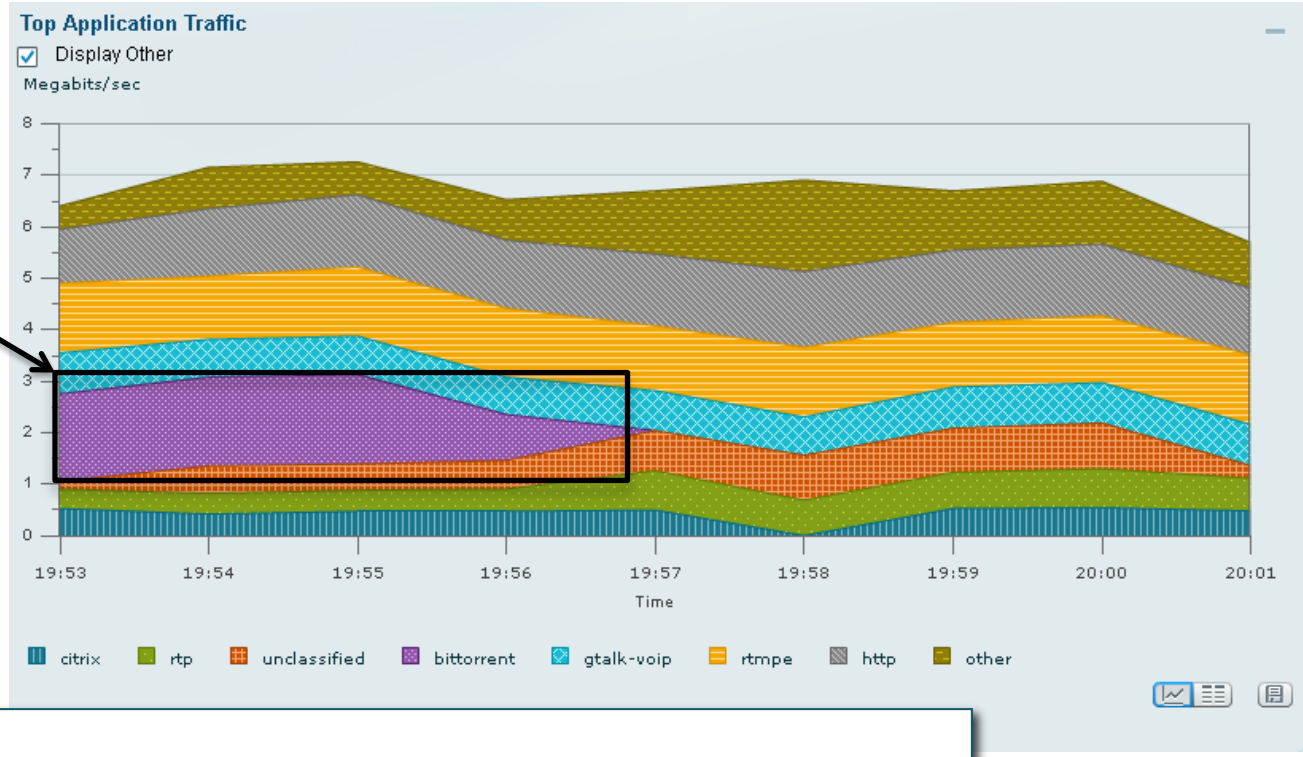
Example: Stop P2P Applications with AVC

After apply control policy






```
class-map match-all p2p-app
 match protocol attribute p2p-technology p2p-tech-yes
policy-map control-policy
 class p2p-app
  police 8000 conform-action transmit exceed-action drop
```

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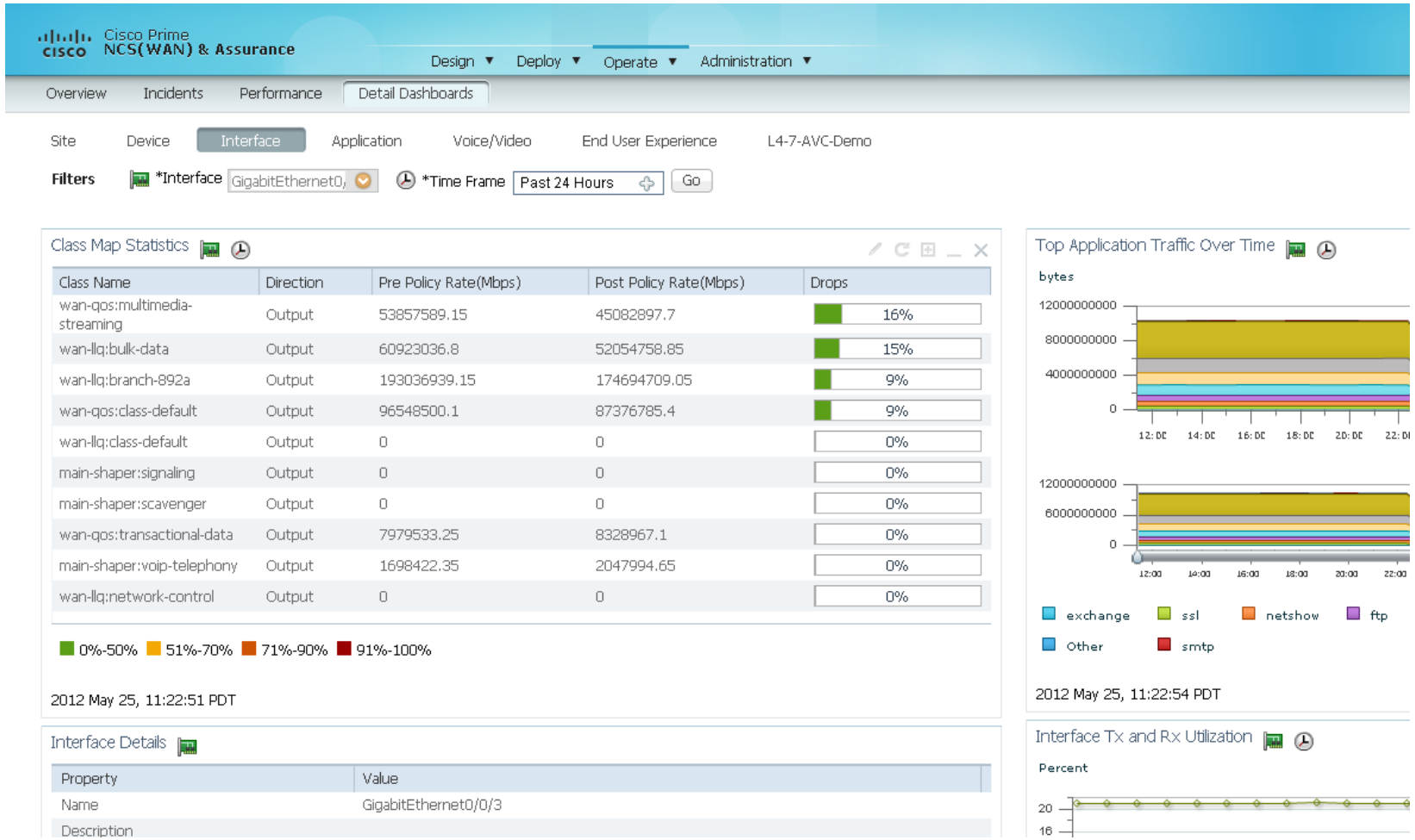
Cisco Prime Infrastructure

Monitor QoS Performance

- Top Application over Time
- QoS Class Map Statistics, Queue Drops, Pre/Post Traffic Rate, from CBWFQ MIBS



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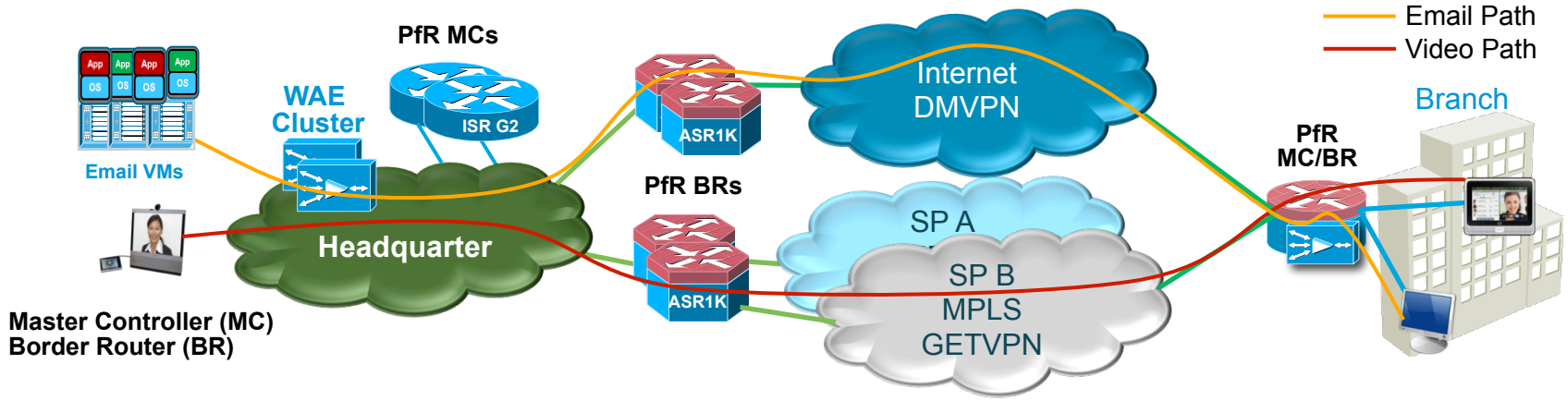
Introducing Performance Routing (PfR)
Application aware adaptive routing

- Full utilization of expensive WAN bandwidth
  - ✓ Efficient distribution of traffic based upon load, circuit cost and path preference
- Improved Application Performance
  - ✓ Per application best path based on delay, loss, jitter measurements
- Increased Application Availability
  - ✓ Protection from carrier black holes and brownouts



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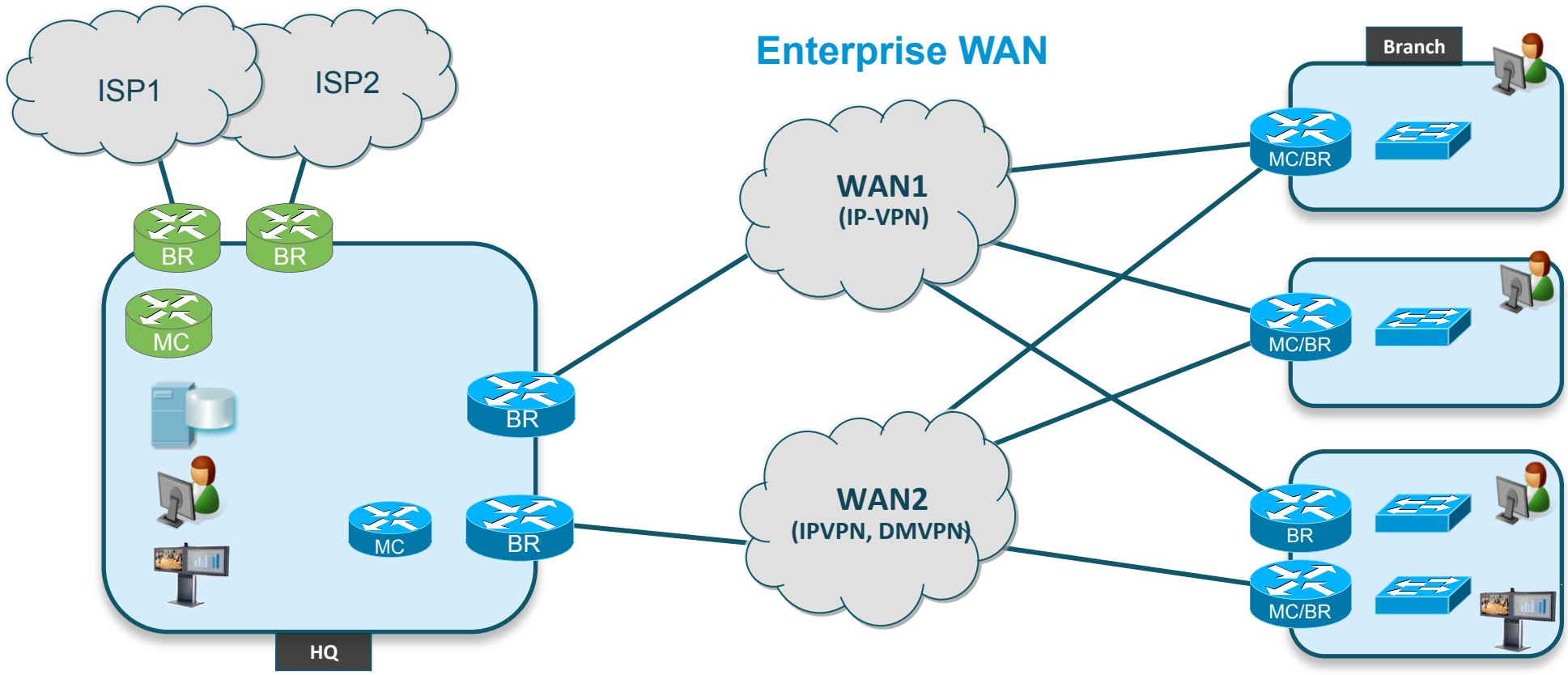
Performance Routing Topologies

Optimize by:
- Reachability, Loss,
- Delay, Jitter, MOS,
- Throughput, Load, and/or $Cost



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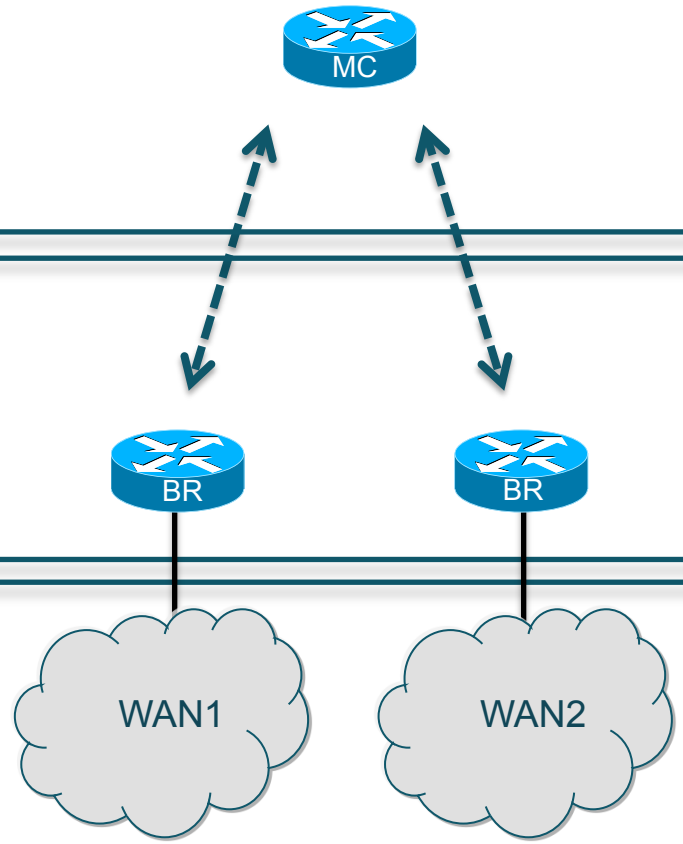
Performance Routing – Components

- The Decision Maker: Master Controller (MC)
  - Apply policy, verification, reporting
  - No packet forwarding/ inspection required
- The Forwarding Path: Border Router (BR)
  - Gain network visibility in forwarding path (Learn, measure)
  - Enforce MC's decision (path enforcement)
- Optimize by:
  - Reachability, Delay, Loss, Jitter, MOS,
  - Throughput, Load, and/or $Cost



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Step #1
Learning Traffic Classes

Learning

- Prefixes
- ACL
- DSCP Based
- Applications

Static

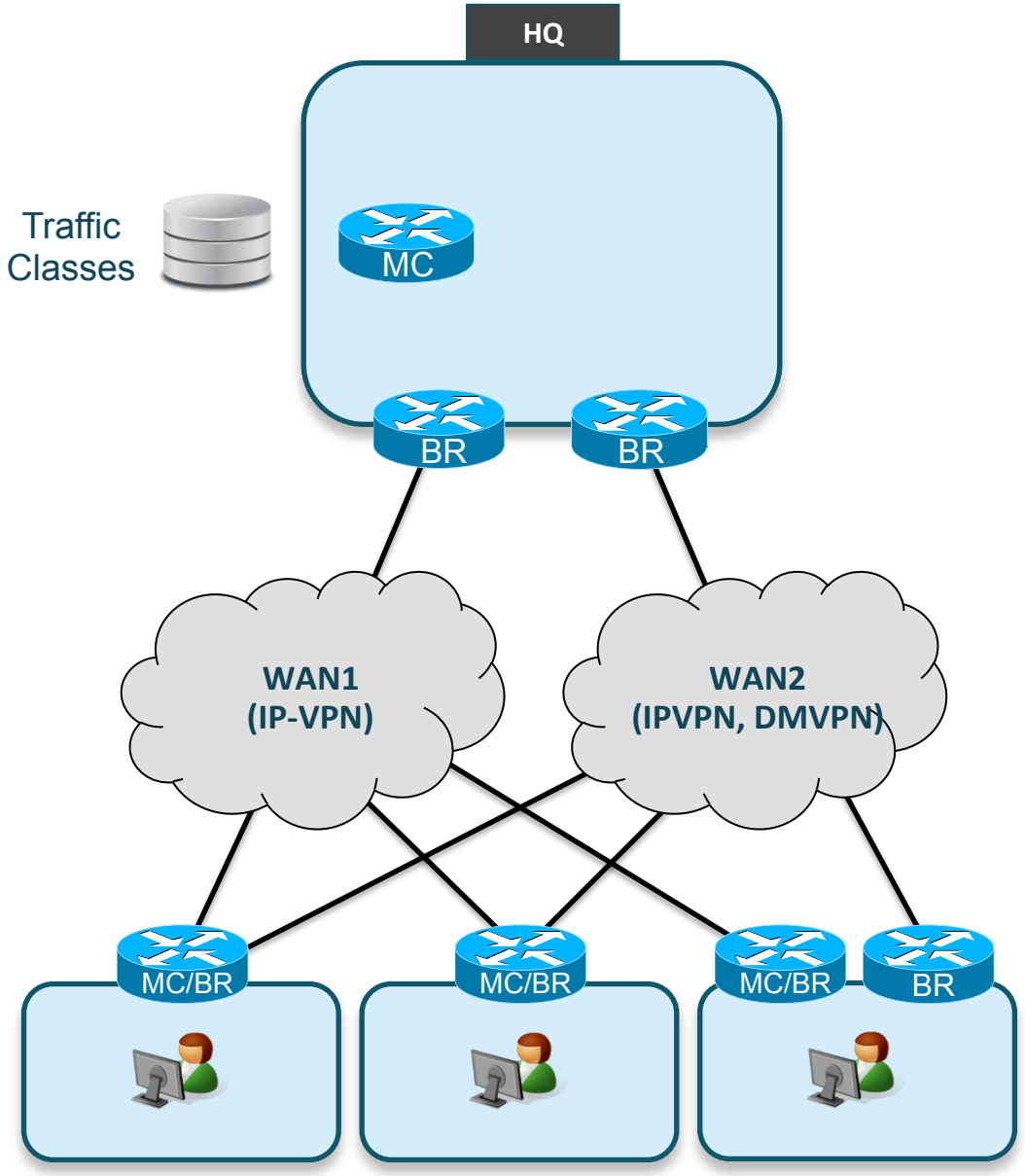
Automatic

Learning

Monitoring (Passive – Active)

Choosing Your Policies

Enforcing the Path



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Learning
PfR Operates on Traffic Classes

- PfR determines the traffic classes from the traffic flowing through the border routers using NetFlow
- Subsets of the total traffic must be identified, and these traffic subsets are named traffic classes

Prefixes

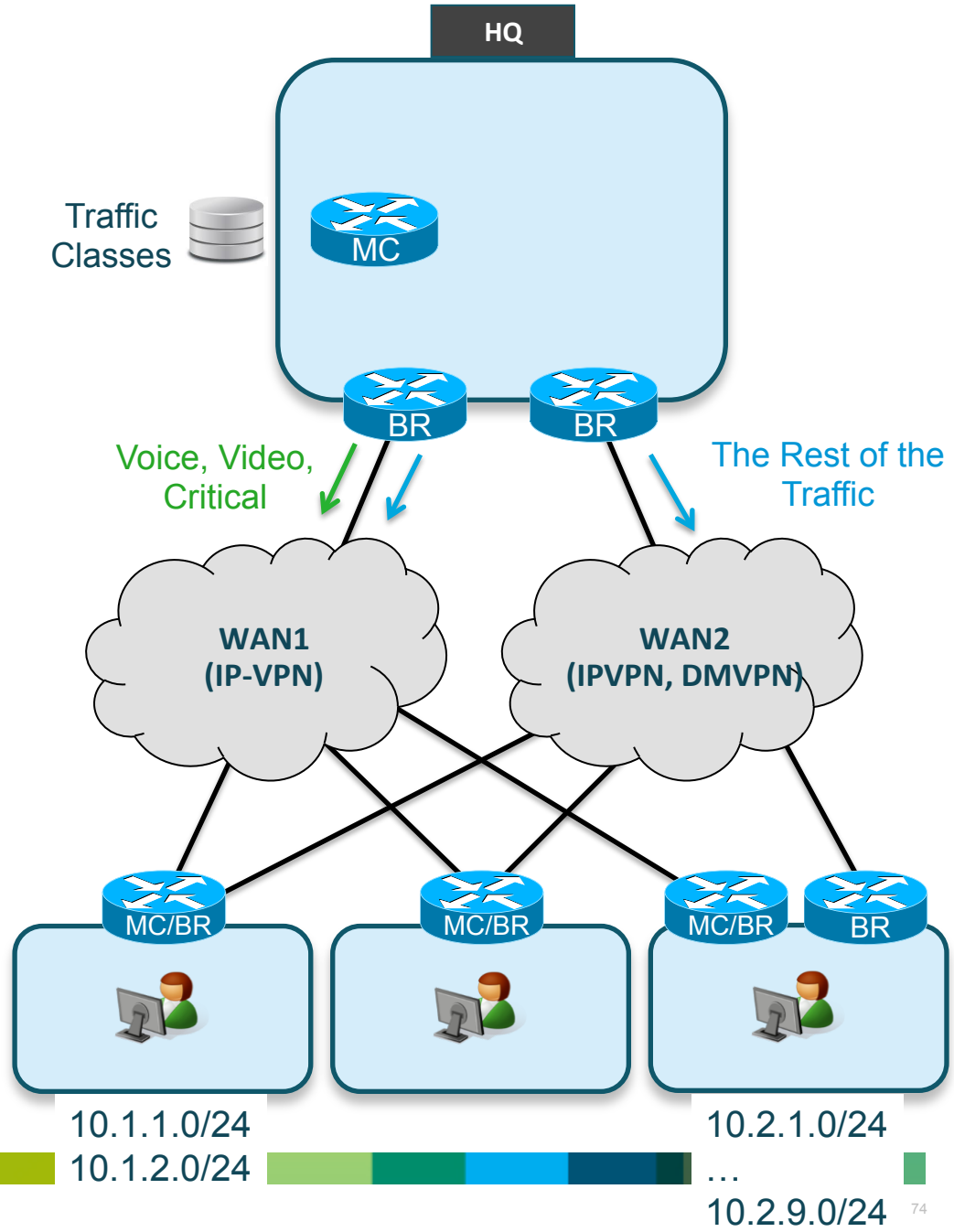
Dest. IP	DSCP	Delay	Loss	Jitter	BW
10.2.2.0/24	-	0	…	…	
…	…	…	…	…	

or

Applications

Dest. IP	DSCP	AppID	Delay	Loss	Jitter	BW
10.2.2.0/24	EF		0	…	…	
…	…		…	…	…	

Dest. IP	DSCP	AppID	Delay	Loss	Jitter	BW
10.2.2.0/24	AF31		0	…	…	
…	…		…	…	…	



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Learning Traffic Classes
Service Class – Group of Applications

Learn

- Voice - Video
- Critical Application
- Rest of the Traffic

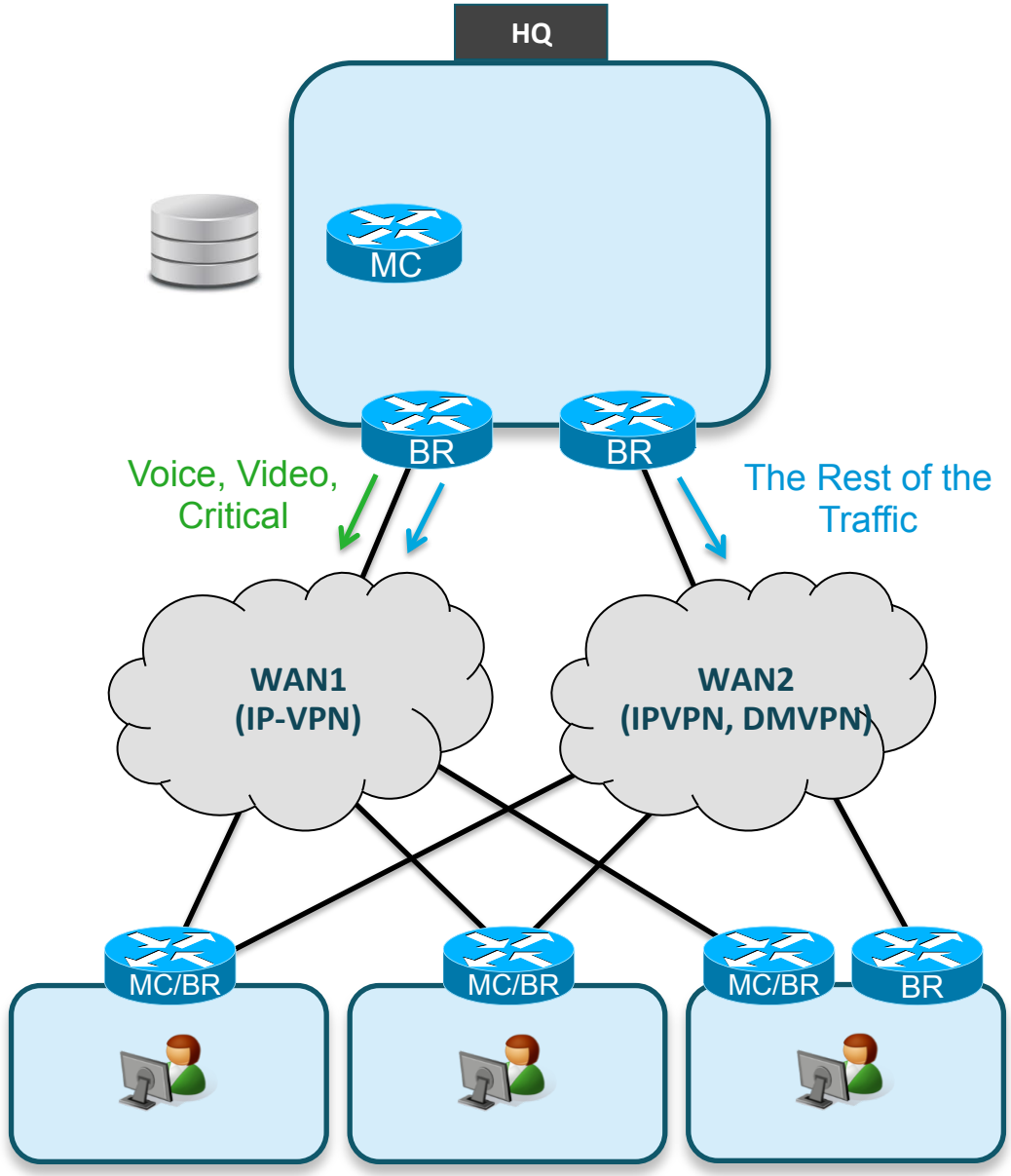
- Define Application Groups
- Aka Similar to the class-map concept in QoS

  Allows to define:

  specific policies per group

  Specific thresholds per group

  Specific monitoring mode per group



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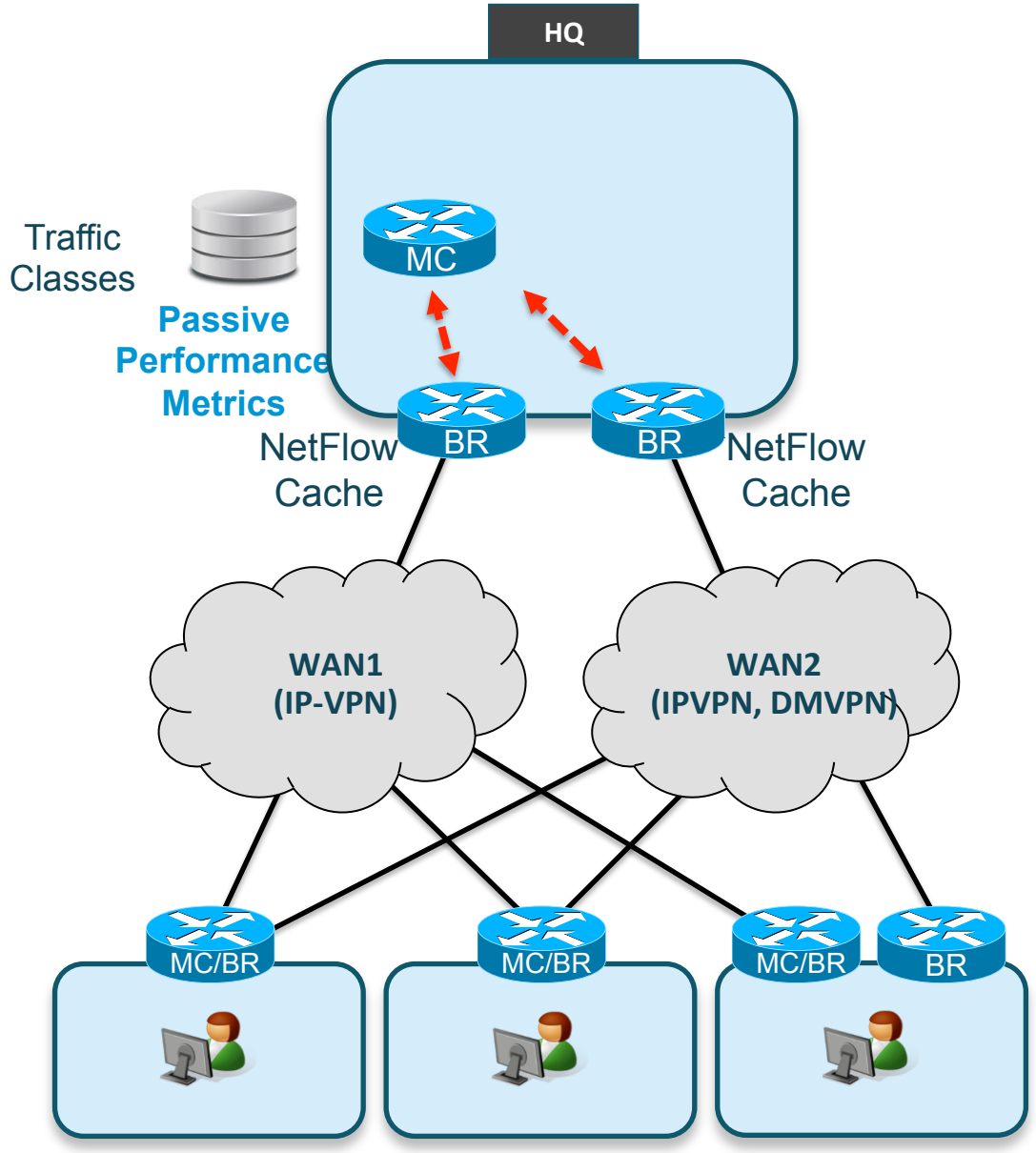
Step #2 – Measurement
Passive and/or Active Monitoring

Passive		
Reachability	Delay	Loss
Egress BW	Ingress BW	

- PfR Netflow Monitoring
- Flows Need not be symmetrical

Active		
Reachability	Delay	Loss
Jitter	MOS	

- PfR enables IP SLA feature
- Probes sourced from BR
- ICMP probes learned or configured
- TCP, UDP, JITTER need ip sla responder



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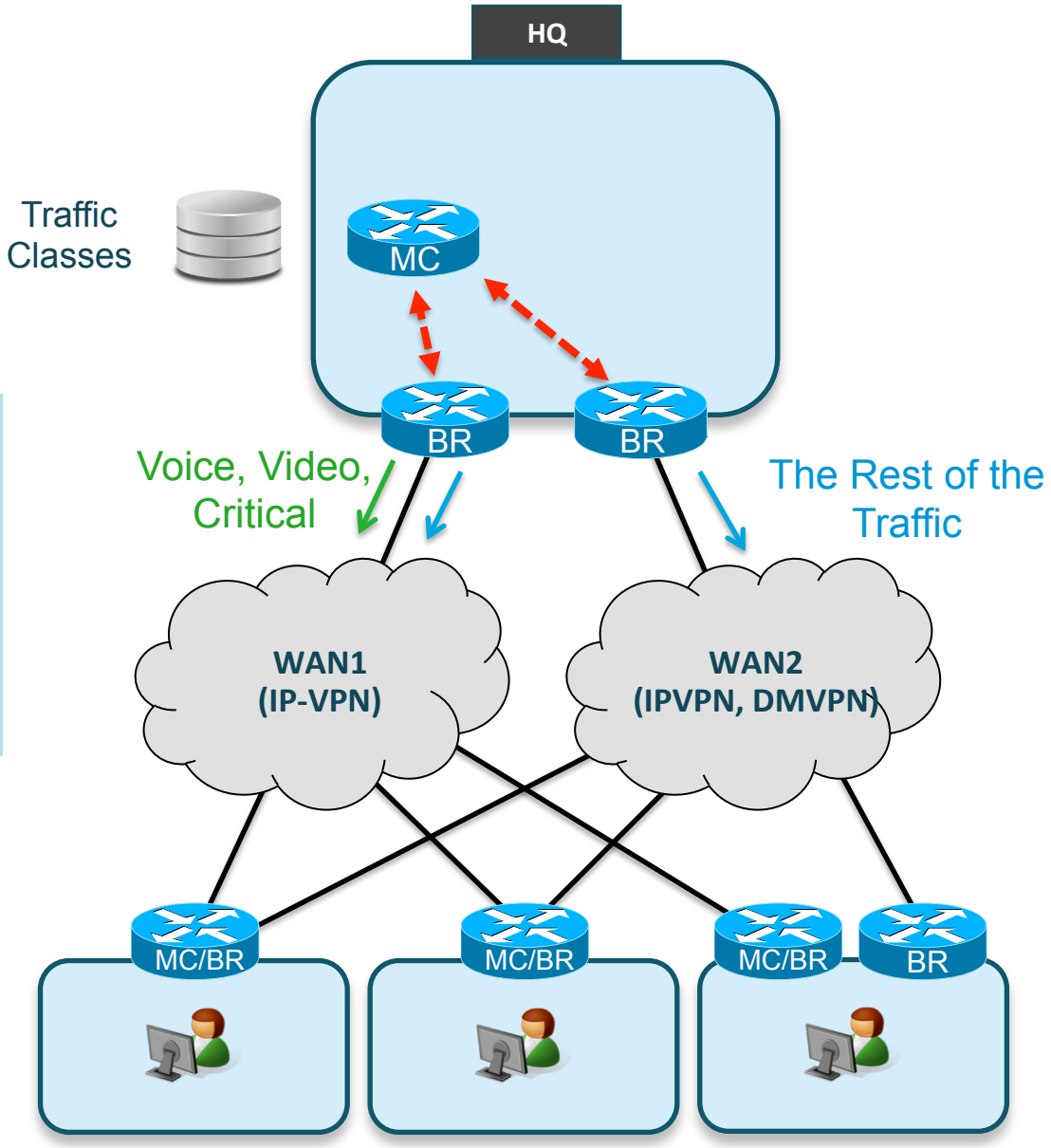
Step #3 – Policy Definitions
Choosing Your Policies

Link	Application Performance
▪ Load balancing ▪ Max utilization ▪ Link grouping ▪ $Cost	▪ Reachability ▪ Delay ▪ Loss ▪ MOS ▪ Jitter

- Learning
- Monitoring (Passive – Active)
- Choosing Your Policies
- Enforcing the Path



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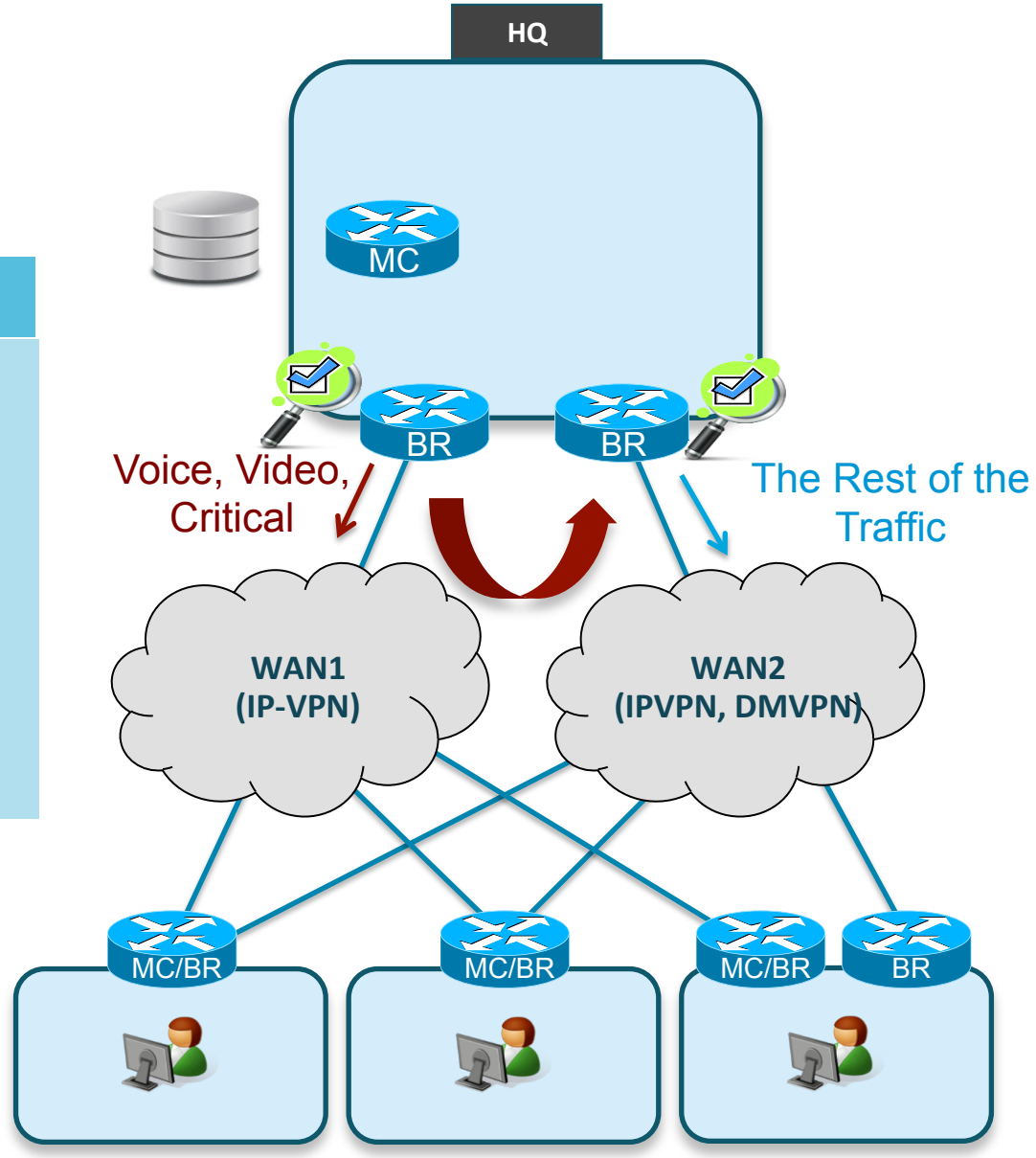
Step #3 – Enforcing the Path
Enforcing the Path

Destination Prefix	Application
▪ BGP – Egress: route injection or Modifying the BGP Local Preference attribute – Ingress: BGP AS-PATH Prepend or AS Community ▪ EIGRP Route Control ▪ Static Route Injection ▪ PIRO	▪ Dynamic PBR ▪ NBAR/CCE

- Learning
- Monitoring (Passive – Active)
- Choosing Your Policies
- Enforcing the Path



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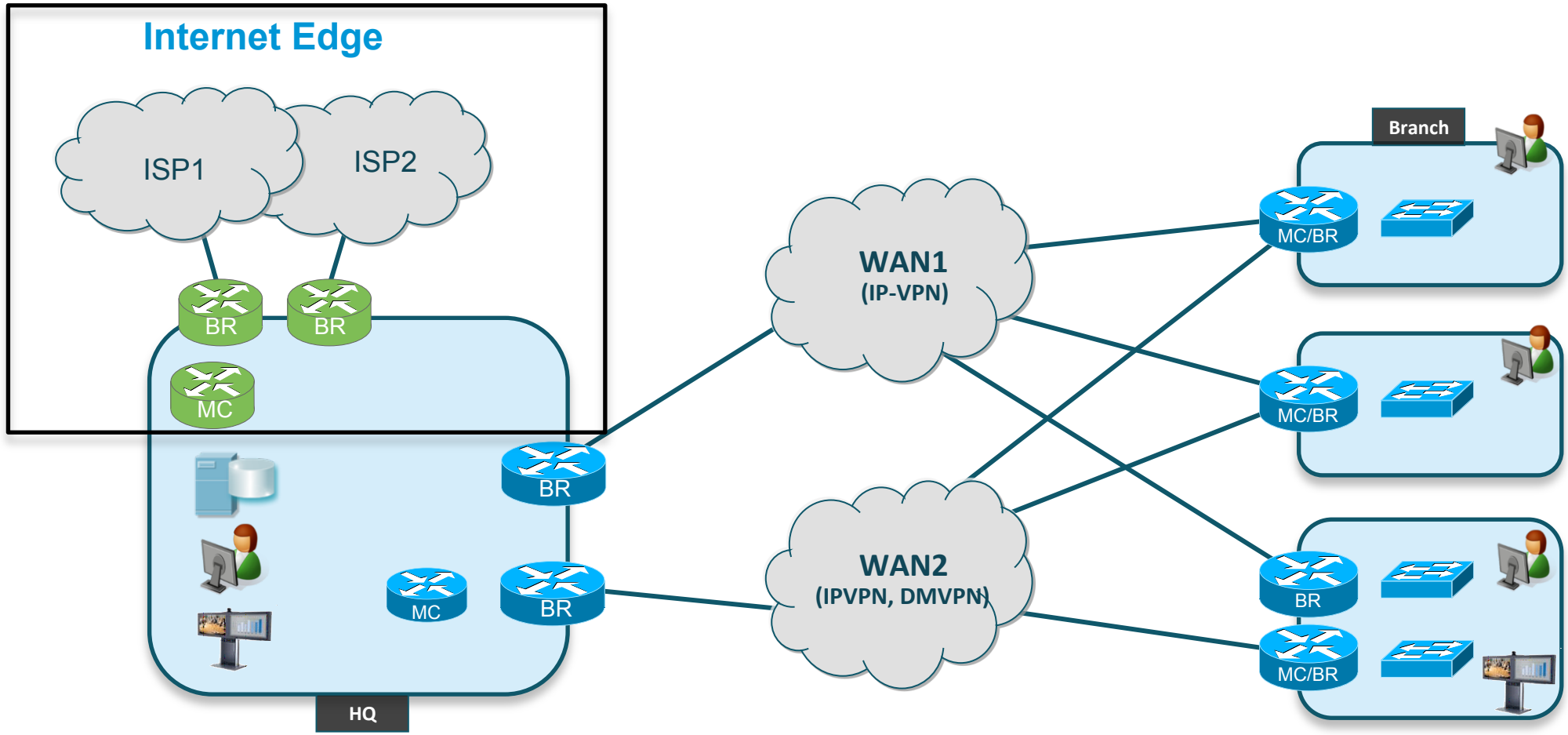
Use Case #1 – Internet Edge
Overview



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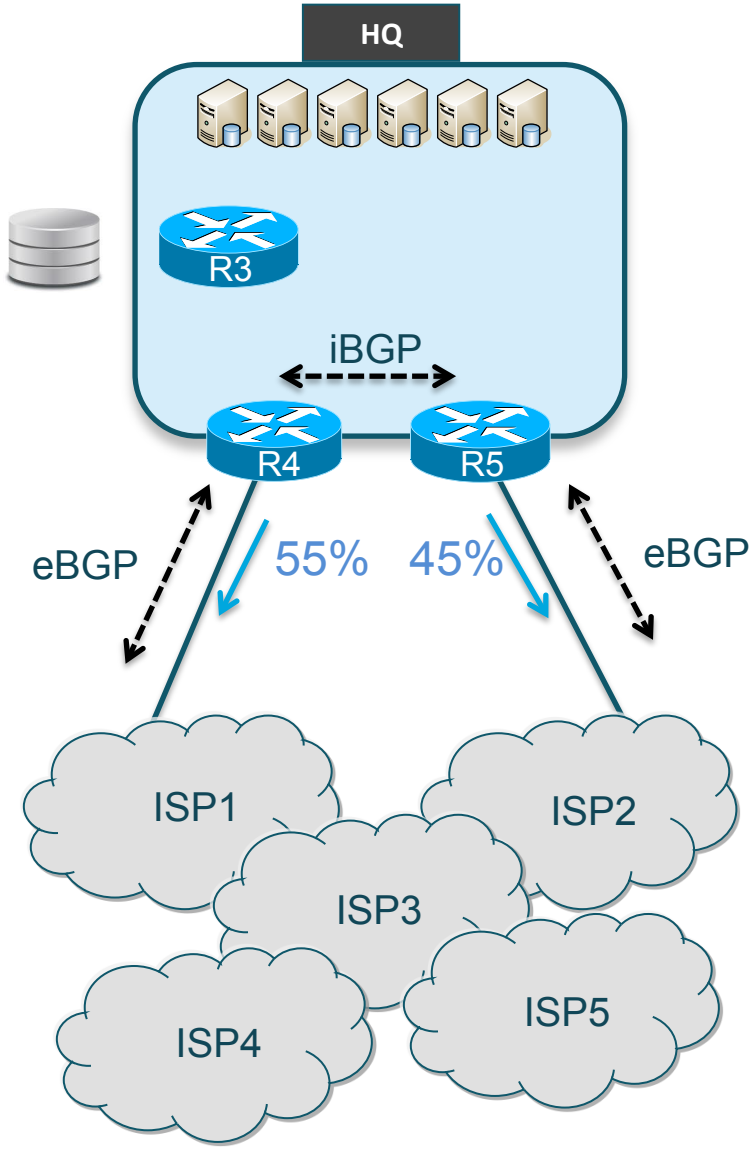
Use Case #1 – Internet Edge
Policies

- Learning
  - Dest Prefixes (NetFlow)
- Monitoring
  - Passive – Global
    - Egress BW
    - Ingress BW
- Policies
  - Load-Balancing (range)
- Path Enforcement
  - BGP
    - Inject BGP Route
    - BGP Local Pref
    - AS-PATH Prepend
    - Community



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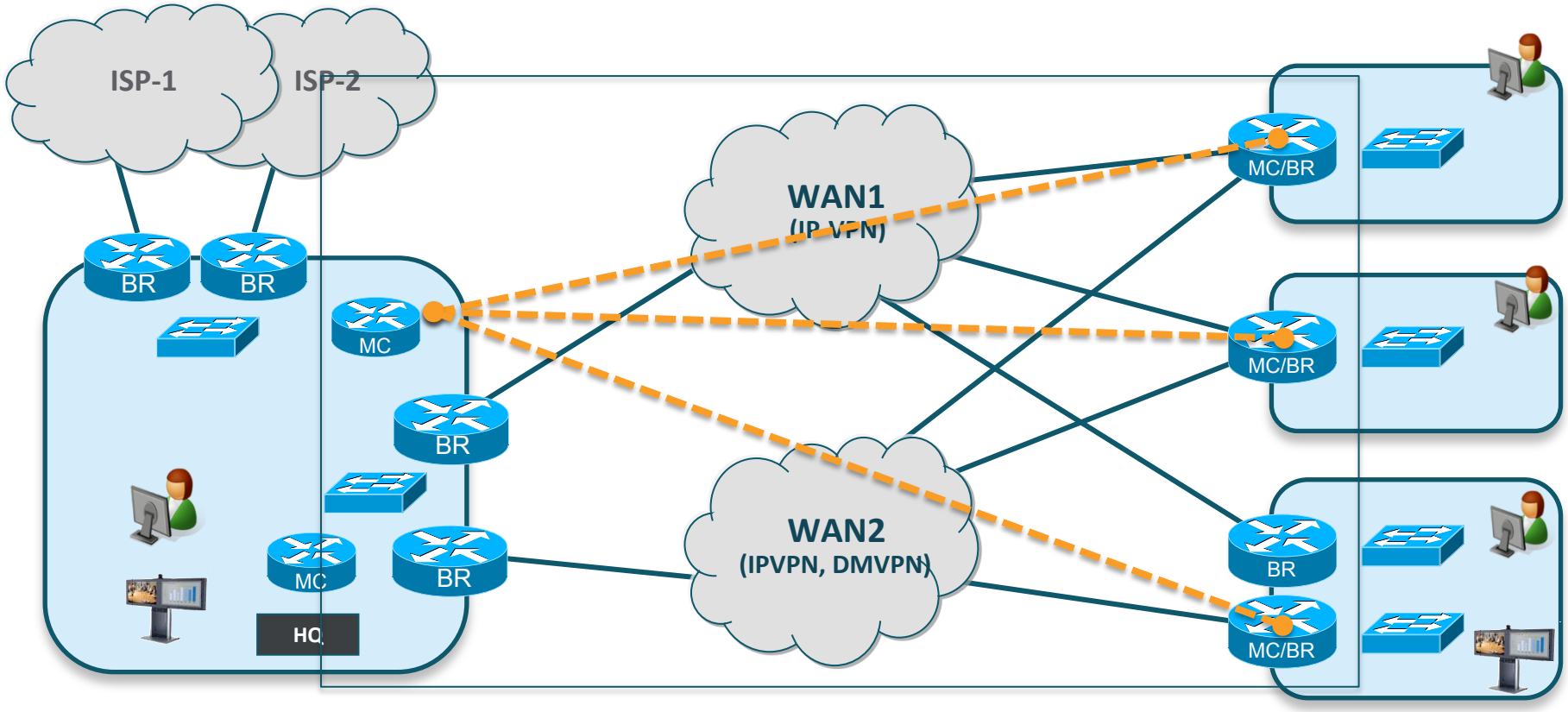
Use Case #2 – Enterprise WAN
Overview



Voice - Video

Critical Application

Rest of the Traffic

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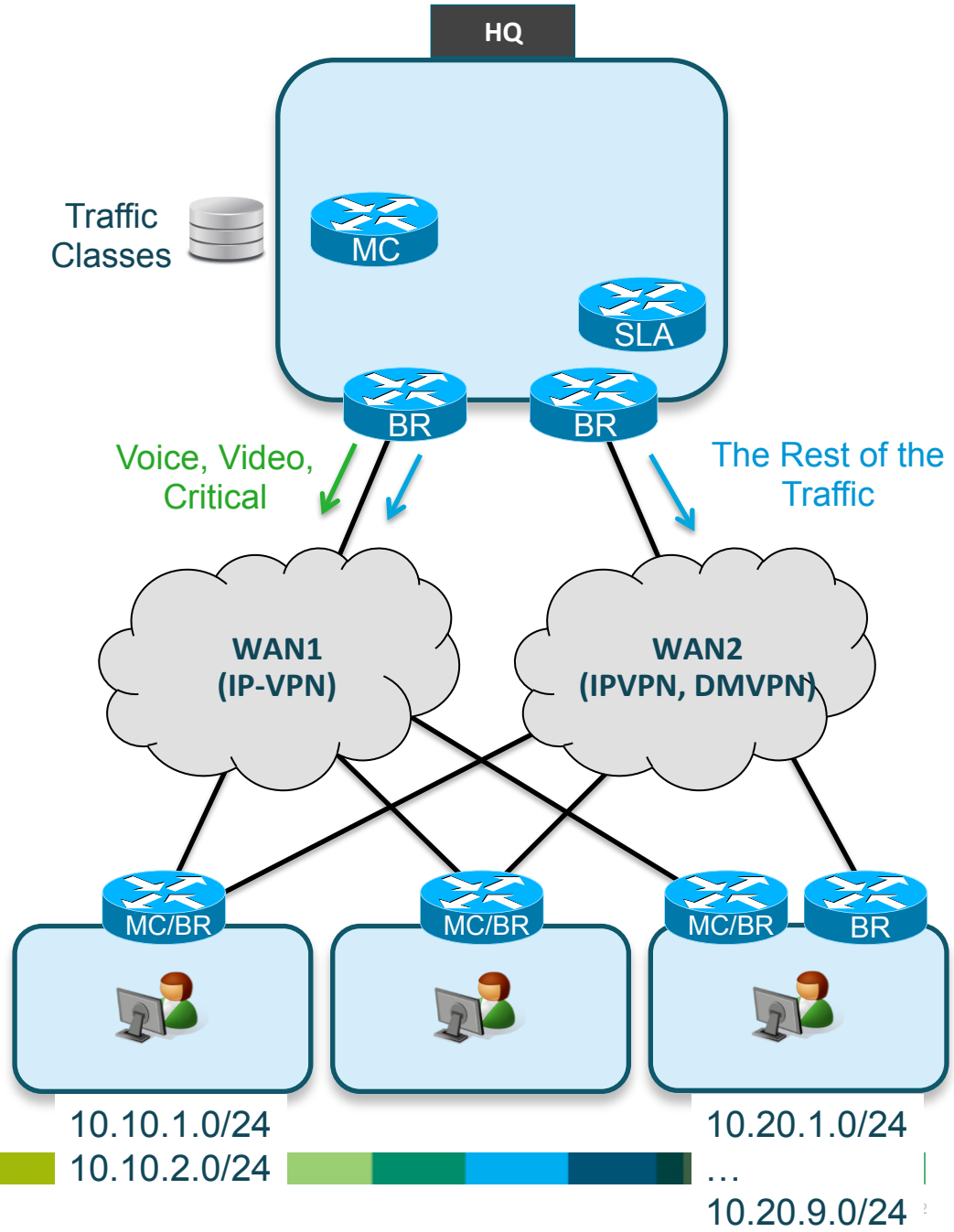
2. Enterprise WAN
Policies

Learning	Applications (NetFlow) Voice/Video Critical Apps BE
Monitoring	Active – Voice/Video Active – Critical Apps Passive – Global
Policies	Voice/Video – Jitter/Delay/Loss Critical – Delay/Loss Global – Load-balancing
Path Enforcement	PBR



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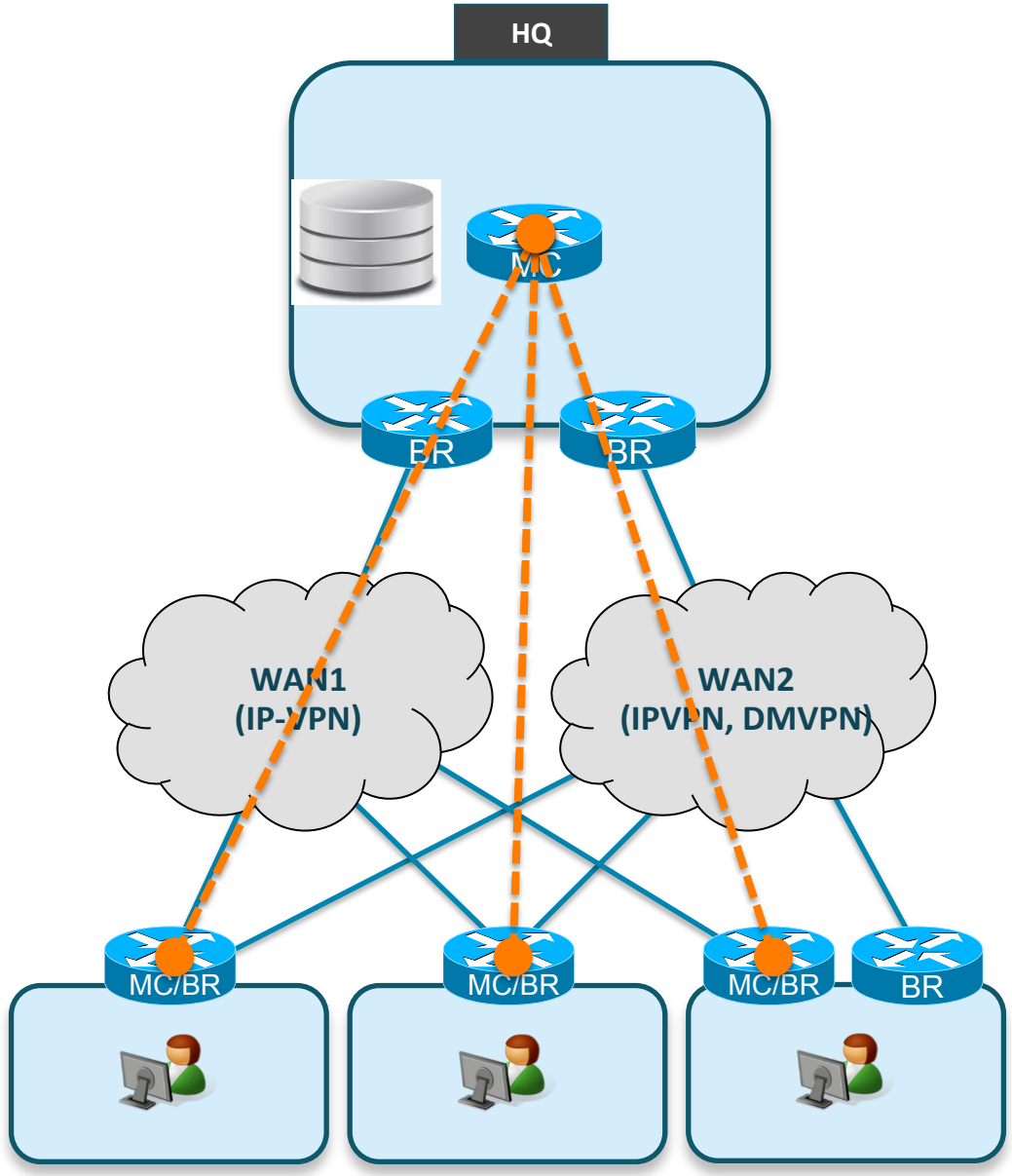
PfR Multisite System Evolution
Peering & Discovery

- Multisite MC Peering Framework
- MC to MC Peering Framework can be used to exchange policies, services and feedback
- Remote Site Discovery
  - Simplifies Configuration – prefix and target discovery
  - Probing Efficiency – sharing of probe data across policies



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Export
NetFlow version 9 and IPFIX

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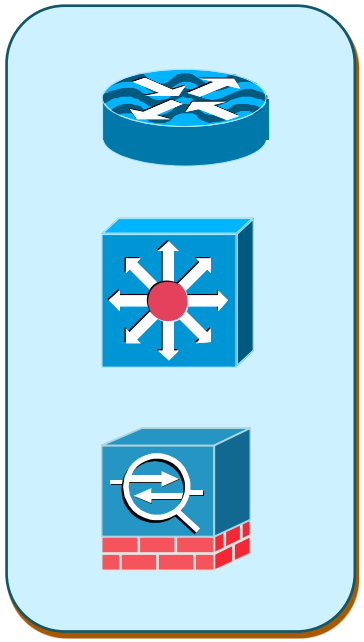
NetFlow Overall Solutions



IETF Scope

NetFlow v5, NetFlow v8,
NetFlow v9,
IPFIX

Capacity Planning
Security
Performance Analysis
Visibility

Metering Process

Export Process

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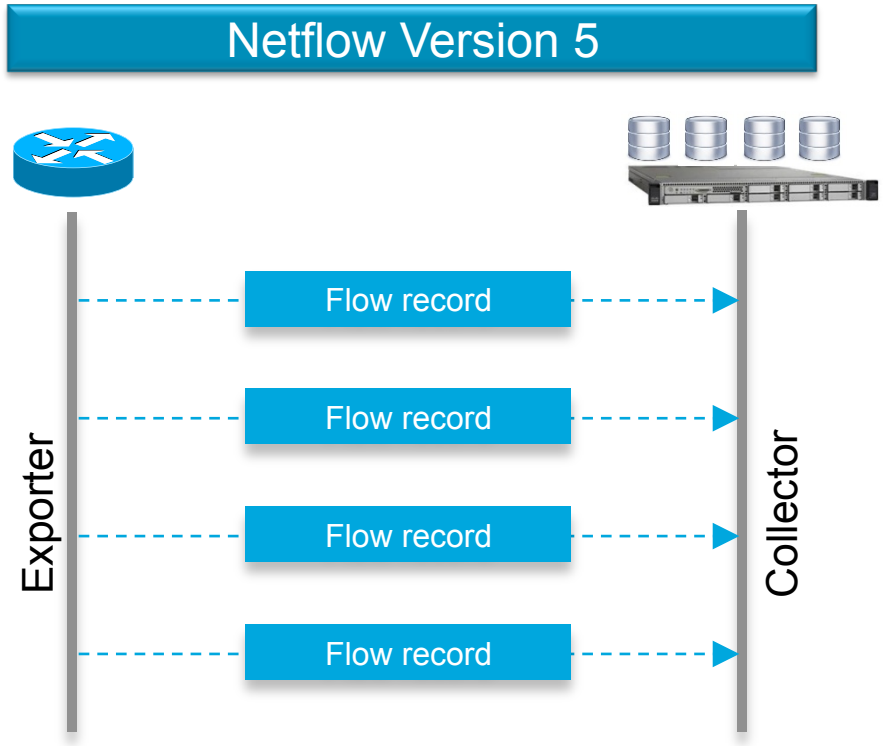
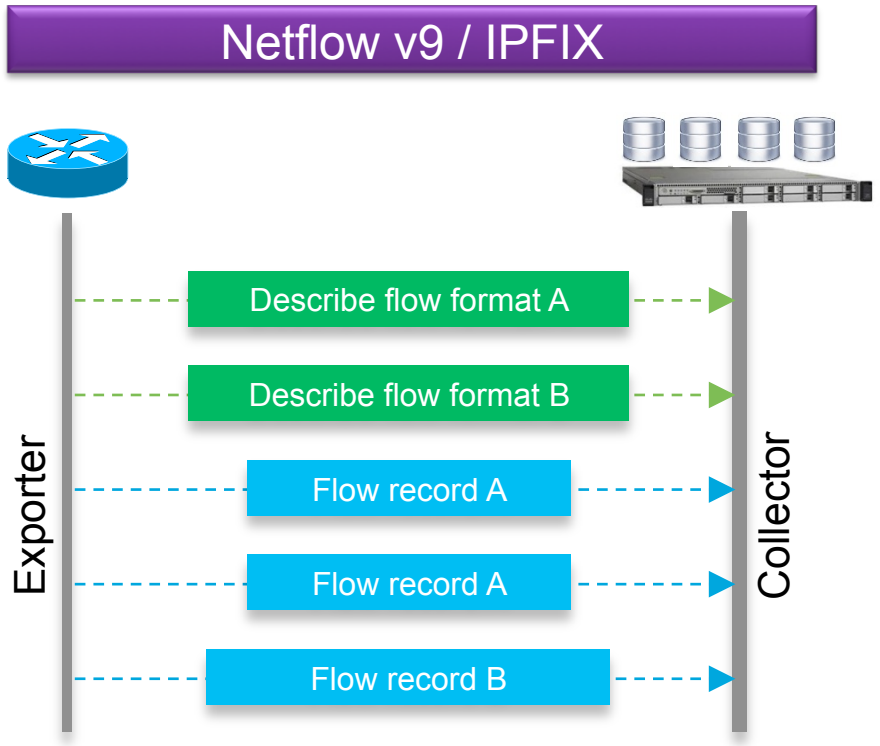
Flexible & Extensible Flow Export Format with NetFlow v9 and IPFIX





- Fixed number of fields (18 fields)

  e.g. source/destination IP & port, input/output interfaces, packet/byte count, ToS

- Users define flow record format
- Flow format is communicated to collector

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Leverage NetFlow Partners Eco-system

More info: http://www.cisco.com/warp/public/732/Tech/nmp/netflow/partners/commercial/

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AVC Management Tool Integration

Company	Product	Use Cases
	Cisco Prime Infrastructure	Network and App Monitoring.
	Gomez & DynaTrace	APM combined with App-aware Network Monitoring
	5View	App-aware Network Monitoring
	LiveAction	Control (QoS) GUI, App-aware Network Monitoring
	Scrutinizer	App-aware Network Monitoring
	LivingObjects	App-Aware Network Monitoring, URL Collection and hit counts
	Proxy Reporter	App-aware Network Monitoring

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Conclusion

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Key Takeaway

What can AVC do for me?	How?
Identify various applications in my network	NBAR2 uses DPI to identify 1000+ applications
Collect traffic information and performance metrics without hardware probe	Embedded monitoring exports information in standard NFv9 or IPFIX format
Provide data for proactive monitoring and troubleshooting	Both Cisco Prime Infrastructure and 3rd party are supported
Tune my network to improve application performance	Application-aware QoS leveraging NBAR2 to identify applications – PfR Path Control

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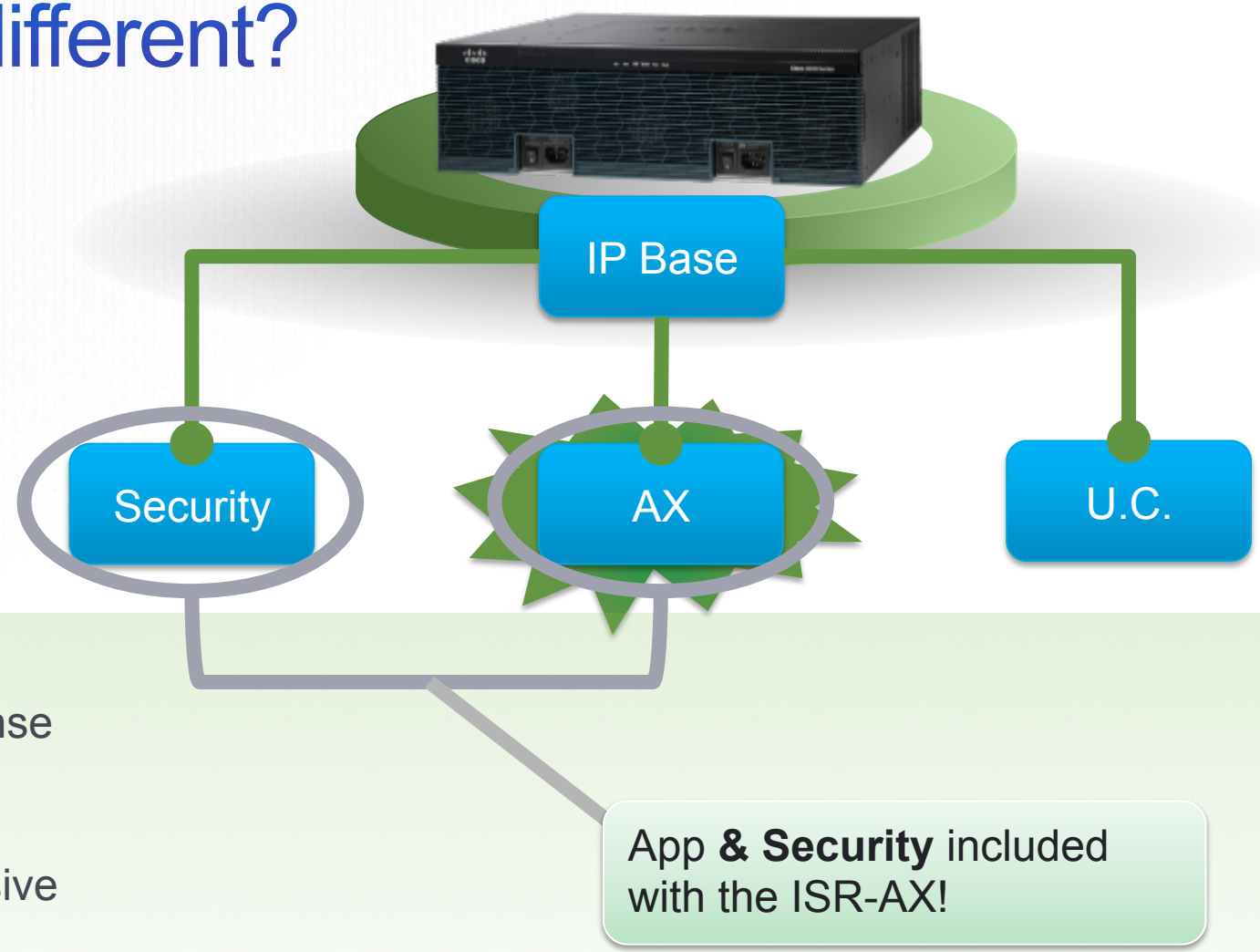
What makes the ISR-AX different?

Introducing the ISR Application Experience License



Extends and replaces the Data license with application router services. All previous Data license features included.

All Application Visibility and Control (AVC) features included. Enables powerful, comprehensive application monitoring and management.

Right-To-Use license for WAAS. License enables WAAS Express, WAAS SRE, or WAAS on UCS-E with no additional software cost.

What is required to use AVC?
WAN Edge

Platform	License
 800	Advanced IP license (advipservices)
 1900	AX License[2]
 2900	AX License[2]
 3900	AX License[2]
 ASR1k	Advanced IP (AIP) or Advanced Enterprise (AES) + FLASR1-AVC-RTU

Cisco Prime Infrastructure Assurance License[1]

Or

Any AVC supported NetFlow collector

1. See Cisco Prime Infrastructure ordering guide at http://www.cisco.com/go/primeinfrastructure
2. AX license (New) includes data license and WAAS right-to-use license

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Technical References

- Application Visibility and Control
  http://www.cisco.com/go/avc
  http://www.cisco.com/go/pfr
- Docwiki.cisco.com
  AVC: http://docwiki.cisco.com/wiki/AVC:Home
  PfR: http://docwiki.cisco.com/wiki/PfR:Home
- AVC Solution Guide for IOS-XE 3.8
  http://www.cisco.com/en/US/docs/ios/solutions_docs/avc/ios_xe3_8/avc_soln_guide_iosxe3_8.html
- NBAR
  http://www.cisco.com/en/US/partner/docs/ios/ios_xe/qos/configuration/guide/clsfy_traffic_nbar_xe.html
- AVC Cisco Developer Network (CDN)
  http://developer.cisco.com/web/avc

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Thank you.