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Troubleshooting of ASR1K and ISR/CAT8k (IOS-XE) Made Easy

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Agenda

- Network-level troubleshooting
- Data plane troubleshooting
- Resource Monitoring
- Wrapping up...



Network Wide Troubleshooting: Radkit





Demo







Why RADKit – Problem Statement



Traditional remote troubleshooting is painful:

- Screen sharing and email are the norm
- Long sessions where the network operator's laptop is stuck, watching the troubleshooter
- Network delay makes UI and CLI unresponsive
- Keyboard mis-mapping makes some important operations impossible

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Network devices can only be addressed one-at-a-time.

Multi-device data collection is tedious. Coordination is hard.

Frequent data capture for monitoring evolution or data refinement is frustrating.

We use the data we have; not the data we need.



Scalable automation is nigh impossible.

Sharing large data sets are slow and labor intensive.

Native structured data and API cannot be leveraged effectively.

Automated analysis is hampered by the quality and amount of humanly collected data.

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What is RADKit ?



RADKit is a Software Development Kit (SDK): a set of ready-to-use tools and Python modules.



Interactively connect to remote terminals, WebUI's or desktops.



Use our powerful and easy to use our efficient and scalable APIs for remote and local automations. •

Full-on security with SSO, Certificates, data encryption at rest and in transit, exhaustive audit-logs,...

RADKit enhances all NetOps activities, streamlines incident escalation processes, and more!





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One place to go

<u>https://radkit.cisco.com</u>



Dataplane troubleshooting





The forwarding plane

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Life of a packet – Traffic entering interface



Life of a packet – Towards Dataplane CPU



Life of a packet – Towards Dataplane CPU



Life of a packet – Dispatching packet to PPE



Life of a packet – Dispatching packet to thread [ASR1K]



Life of a packet - Processing FIA



Life of a packet – Leaving DP CPU after FIA processing



Life of a packet – Queueing



Life of a packet – Towards egress interface



Life of a packet – On the wire after leaving egress interface



Life of a packet – On the wire after leaving egress interface



Arming conditional debugger



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Arming conditional debugger – few examples Introduced in 17.8 Cat8000v#debug platform condition match ipv4 protocol tcp host 1.1.1.1 host 2.2.2.2 eg 23 both bidirection cat8000v#debug platform condition start • Filter for telnet from 1.1.1.1 to 2.2.2.2 – including return traffic Condition applied globally on ingress and egress FIA Cat8000v#debug platform condition interface gigabitEthernet 1 ipv4 1.1.1.1/32 ingress cat8000v#debug platform condition start • Filter for traffic from or to 1.1.1.1 only on Gig1. Condition applied only on ingress FIA of Gig1 Cat8000v#debug platform condition stop Stop conditional matching Cat8000v#clear platform condition all Clear packet-trace buffer and all conditions

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Arming packet-tracer – few examples

Introduced in 17.8

Cat8000v#debug platform packet-tracer packet 256 fia-trace cat8000v#debug platform packet-tracer copy packet both size 1500

Tracing 256 packets with FIA-trace enabled
Insert the packet dump into the trace
Conditional matching must be started in order to trace
Specific filter must be configured in conditional matching

Cat8000v#debug platform packet-trace drop code cat8000v#debug platform condition start	<drop code=""></drop>	
	 Tracing traffic only dropped traffic for drop code <>. "debug platform condition start" alone supported 	

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Demo





Network Topology







Breaking, Multiplying and Gluing Packets

Patterns of Interest

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Multicast Replication



0 Gi1	<none></none>	CONS	Packet Consumed Silently
1 Gi1	Gi2	FWD	
2 Gi1	Gi3	FWD	
3 Gi1	Gi4	FWD	

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Fragmentation



0 Gi1	<none></none>	CONS	Packet Consumed Silently	
1 Gi1	Gi2	FWD		
2 Gi1	Gi2	FWD		

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ICMP Echo Request & Reply





Reassembly of For-Us Packets

• (e.g. large ICMP Echo Request-Reply)





Virtual Reassembly of Pass-Thru Packets

• (e.g. with NAT)



Fragment 1 enters and is processed until VFR. Then the packet freezes. Fragment 2 enters until VFR at which point Fragment 1 is released and processing continues.
Reassembly of GET-VPN Packets (I)



Reassembly of GET-VPN Packets (II)



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Reassembly of GET-VPN Packets (III)



Feature: IPV4_INPUT_IPSEC_INLINE_PROCESS Entry : Input - 0x8166b250 Input : GigabitEthernet3 Output : <unknown> Lapsed time : 882533 ns

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Reassembly of GET-VPN Packets (IV)



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Reassembly of Overlay VPN Packets (I) – e.g. FlexVPN



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Reassembly of Overlay VPN Packets (II)



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Reassembly of Overlay VPN Packets (III)



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Reassembly of Overlay VPN Packets (IV)



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Packet Tracing Ressources - try it yourself

- Tech Zone Article (with examples)
 - <u>https://www.cisco.com/c/en/us/support/docs/content-</u> <u>networking/adaptive-session-redundancy-asr/117858-technote-asr-</u> <u>00.html</u>
- CCO Documentation
 - <u>https://www.cisco.com/c/en/us/td/docs/routers/asr1000/configuration/g</u> <u>uide/chassis/asrswcfg/Packet_Trace.html</u>

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Network wide troubleshooting: NWPI cisco live

A problem occurs





Calling helpdek Discovering either Source IP or application in use [Site], [VPN], [APP] or [SRC IP]

Current workflow:

- Log manually into the first router and troubleshoot
- Discover next nop
- · Log manually into the second router and troubleshoot
- · Repeat... until finding the device that is culprit
- What if the issue is on the internet? How do I know?

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Set a condition Start tracing



Phase II 20.6

Start tracin	y	[Site], [VPN],	, [APP]			
Filter condition and metadate including a Trace ID will be passed to 1 c-edge	vManage	TRACE	covery 🕢			How to Get Started FA Selected trace: trace_656 (Trace Id: 6)
Filter condition applied on 1 edge device		Filters: Ste ID(*): VPIN*): 12 VPIN - 1 Advanced Filters: > Monitor Settings: >	Source Address/Prefix:	Destination Address/Prefix: O Applicati e.g.v4: 10.0.0.0/8 or v6: 2001:0:0:1::/64 Select one or r	In ① Application Group	Start Cancel
			oup≁	Tools · Network Wide Path Ir	isight	
	×	28	Star Trac Star Sour Estar Star Star Star Star Star Star	e id: 656 t Time: Wed Jun 15 2022 10:27:28 GMT-0700 (Pacific Daylight Tin ree Site: 12 ==== Device List ======== ice IP: 172.16.255.12 us: success sage: Trace Starting	re)	

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Append metadata on traffic and trace / stream



Tracing based on metadata and outcome streaming – Transitive Condition



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Tracing based on metadata and outcome streaming



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Reusing Common Flow table to discover return flows







Traced flow insights - advanced view





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Traced flow insights - advanced view - downstream



by vManage



Traced flow insights - advanced view - downstream



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by vManage

Traced flow insights - advanced view - Geography

Full visibility



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[Site], [VPN], [APP]

A glimpse in the future NWPI Phase III 20.9 - 17.9

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Flow level readout of "Path Insight"



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Overview Readout



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Overview Readout



App Performance Insight



App Performance Insight snapshot: Thursday, May 19, 2022 at 10:37:19 AM GMT+08:00



Upstream Application Performance(PPS)



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Event Insight









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QoS Insight





Traffic & QoS Insight snapshot: Tuesday, May 24, 2022 at 5:46:13 PM GMT+08:00





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QoS Insight





Show platform resources

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Resources: simplified view

Resource	Usage	Max	Warning	Critical	State
RPO (ok, active)					н
Control Processor	27.44%	100%	80%	90%	н
DRAM	4122MB(52%)	7897MB	88%	93%	н
ESP0(ok, active)					н
QFP					н
DRAM	188960KB(36%)	524288KB	85%	95%	н
IRAM	207KB(10%)	2048KB	85%	95%	н
CPU Utilization	1.00%	100%	90%	95%	н
B4Q Pool 124	5KB(0%)	1587KB	75%	85%	н
B4Q Pool 128	2KB(0%)	1966KB	75%	85%	н
B4Q Pool 256	8KB(0%)	3932KB	75%	85%	н
B4Q Pool 512	15KB(0%)	5767KB	75%	85%	н
B4Q Pool 1024	43KB(0%)	8155KB	75%	85%	н
B4Q Pool 1536	54KB(0%)	9678KB	75%	85%	н
B4Q Pool 2048	58KB(0%)	8634KB	75%	85%	н
B4Q Pool 4096	128KB(1%)	8260KB	75%	85%	н
B4Q Pool 10240	230KB(3%)	6470KB	75%	85%	н
B4Q Pool 16384	0KB(0%)	1296KB	75%	85%	н
B4Q PMD	8553KB(3%)	236544KB	75%	85%	н



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Software Architecture

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Wrapping up...

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New Debugging Strategy





- show interface, show ip route, show bgp ...
- Feature debugging



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Platform Control Plane

- Unified show commands
- Platform show commands
- Future: control plane conditional debugging

Data Plane

- Packet Tracer
- Forwarding plane conditional debugging
- Embedded Packet Capture

Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.
- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.



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