UKNOF 50

Simon Beevers

Septemeber 2022

Agenda

- Paragon Active Assurance (PAA)

Name: Simon Beevers.

Role: Systems Engineer for UK&I T2 Service Providers, focusing on Metro and Aggregation.

Stakeholder Management ● Strategic Planning ● Technology Leadership and Direction

Overview: Network Architect working in the UK SP space for nearly 15 years, with a deep passion for end user experience and working with SP to deliver efficient future proof networks with the end user in mind.

Job History: I have worked as a Network Architect/Team manager within several UK Utilities and Broadband providers such as Glide, PCCW Global Networks UK (formerly Keycom), and achieved Senior Operations roles within Plusnet/BT, Griffin Internet.

Joined Juniper in June 2021.

Volunteering: An independent member of the LINX Program Committee (LPC).

Contact: https://www.linkedin.com/in/meckanix/

Personal Mission Statement:

"My passion is for designing networks focused on customer experience."

Simon Beevers

Junipers Mission Statement:

"…we need to get the network out of the way, so we can focus on executing strategies and driving business forward."

Rami Rahim

https://blogs.juniper.net/en-us/service-provider-transformation/juniper-moves-the-network-out-of-the-way-so-you-can-focus-on-customer-experience.

Paragon Active Assurance (PAA)

JUNIPER NETWORKS | Driven by Experience™

What is Paragon Active Assurance (PAA)?

This offers end-to-end monitoring of your network and can give the customer service(s) that you've just provisioned an accurate and clear 'birth certificate'.

Ease of use:

- Networking KPIs out-of-the-box
- Instant SaaS

Deep networking capabilities:

- L2 to L7 traffic generation
- Flexible networking

Automated testing and monitoring:

- Validate deliveries & changes
- Real-time data plane monitoring

https://www.juniper.net/us/en/products/network-automation/paragon-active-assurance.html

Reality Check – Customers First to Find Problems

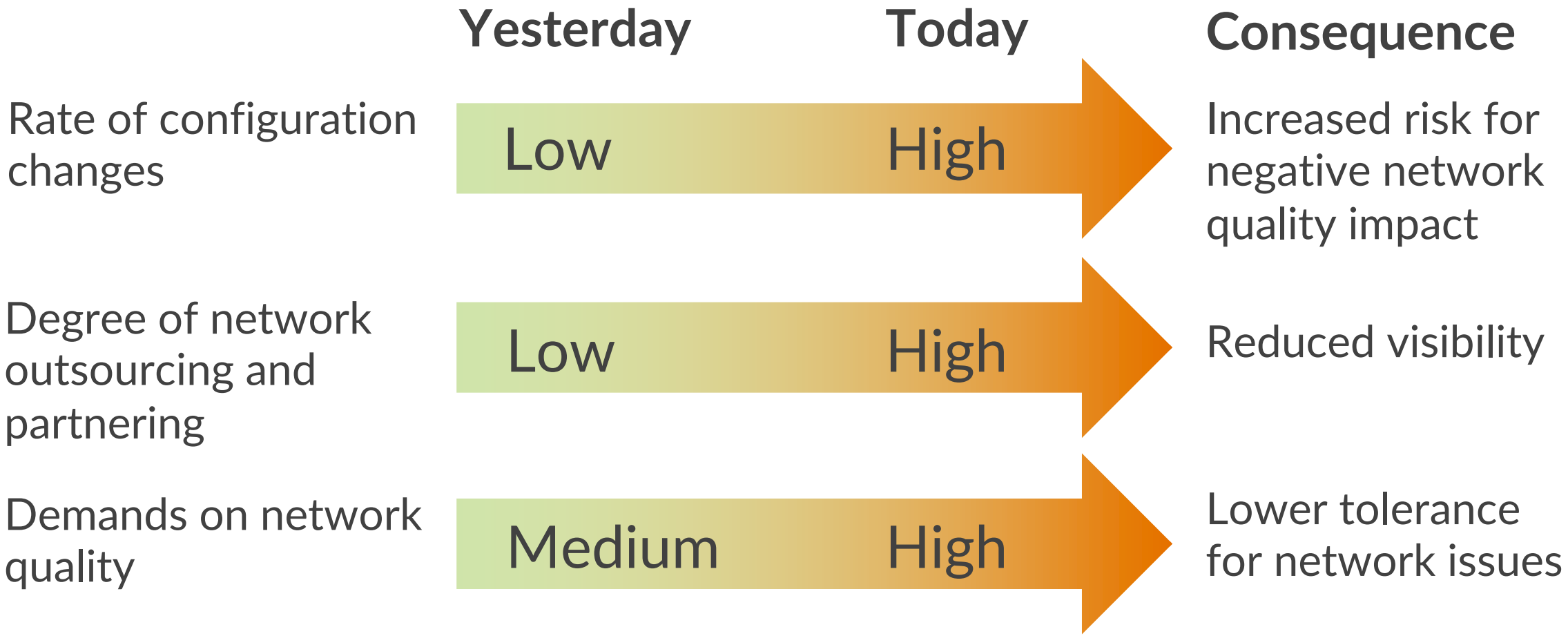
60% of network problems are discovered first by end-users – or not reported at all

Source: Independently conducted survey of 200 US enterprises, requested by Netrounds in May 2019

Business impact

Operations spending most of their time in “War Rooms”

Underlying Reasons Why Users Discover Problems

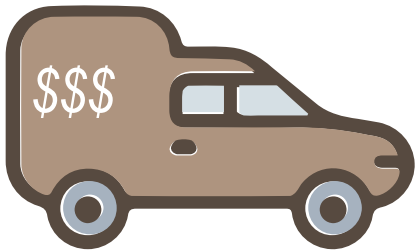


Reality Check – Services Not Tested Thoroughly

DO NOTHING

SIMPLE PING

FIELD EFFORTS SOMETIMES



Business impact

Failed deliveries lead to bad reputation and churn, plus expensive repair

One Solution for the Operational Service Lifecycle

Validate Designs and Changes

Eng Ops 1

Synthetic testing at operational load scale before release

Example Service Activation Testing:

- One-way Jitter
- Packet Loss
- Service Latency
- QoS Prioritization

Augment service change with comprehensive synthetic testing

Discover Issues Earlier

Ops 2

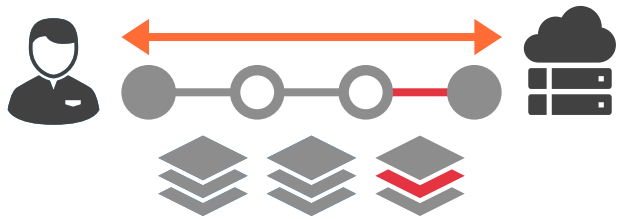
Non-intrusive active monitoring

Monitor end-to-end SLAs using active traffic with realtime KPI drill-down

Resolve Problems Faster

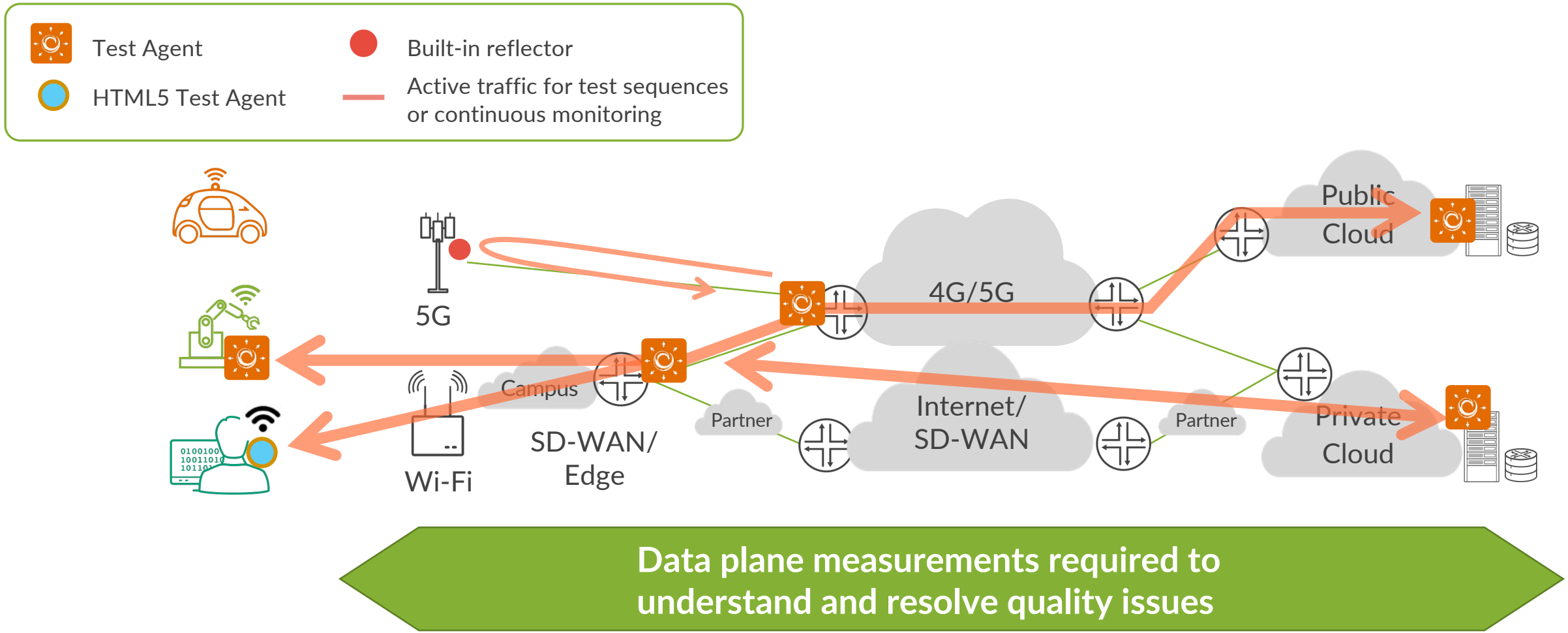
Eng Ops 3

Troubleshooting tests for reduced restoration time



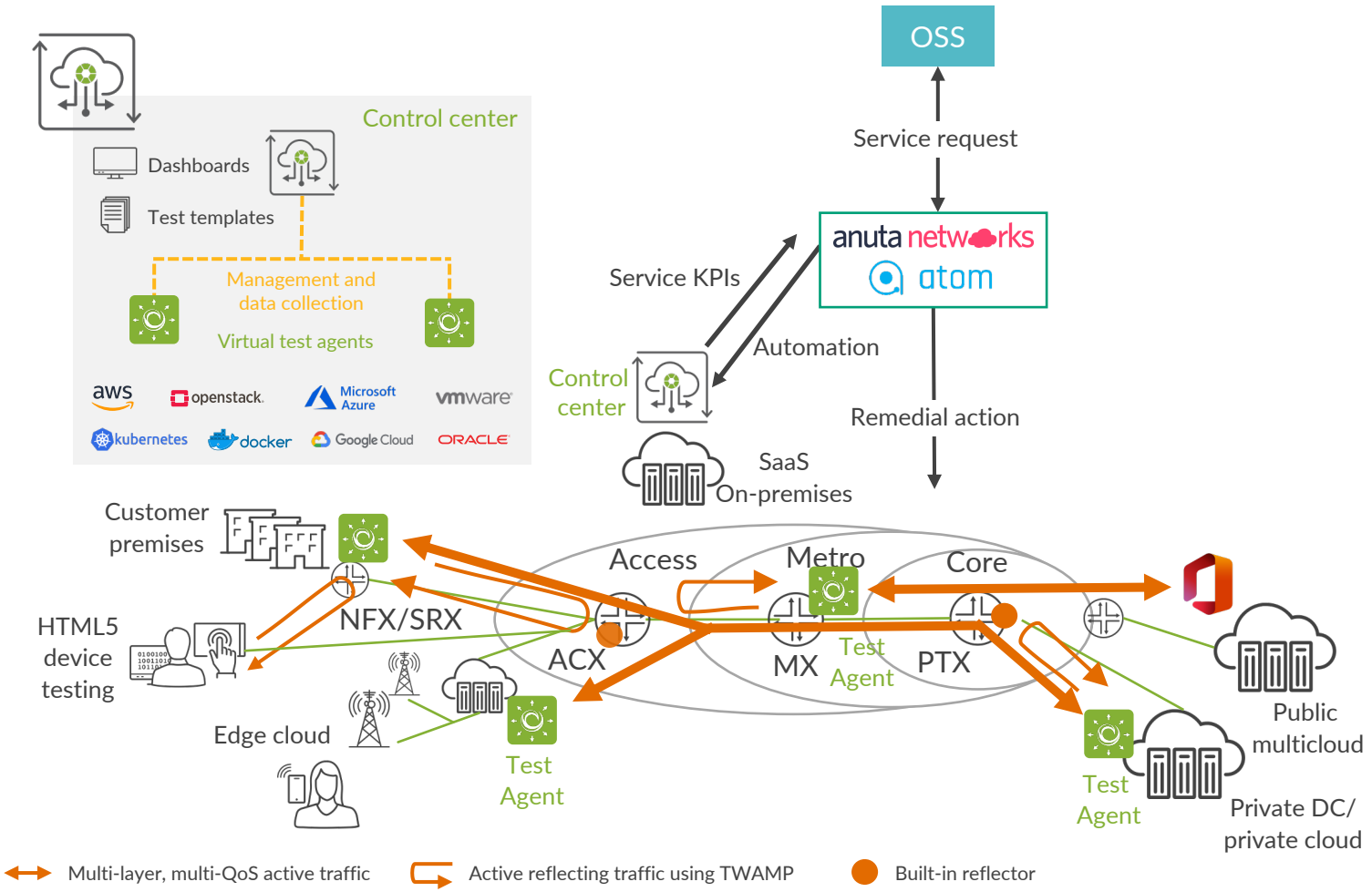
Automate trouble-shooting at any location in service delivery chain

Paragon Active Assurance: Active Traffic on the Data Plane



Validate service quality with Active Assurance

Paragon Active Assurance



Assures customer experience

- Confirm service levels support business objectives
- Validate changes, ensure nothing breaks
- L2–L7 service quality metrics

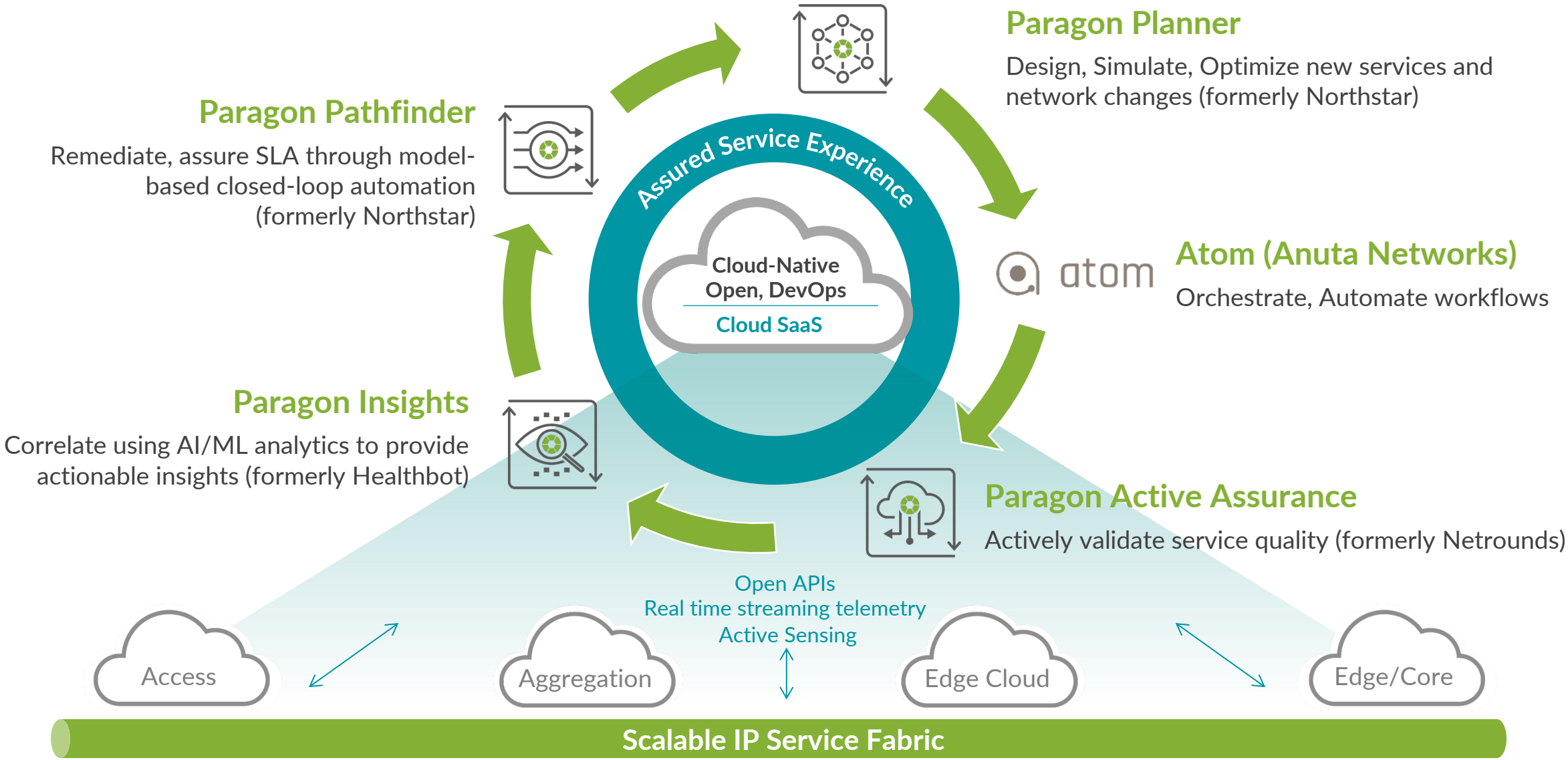
Accelerates time to revenue

- Automate turn-up testing processes
- Simple deployment for visibility across complex networks
- Cloud-ready SaaS or on-premises deployment

Shortens time to resolution

- Empower operation engineers with real-time data plane monitoring
- Quickly locate issues in end-to-end service chain
- Gain visibility over third-party provider networks
- Confirm performance in virtualized networks

Juniper Paragon Automation Powers the WAN



Paragon Planner

Design, Simulate, Optimize new services and network changes (formerly Northstar)

Paragon Pathfinder

Remediate, assure SLA through model-based closed-loop automation (formerly Northstar)

Atom (Anuta Networks)

Orchestrate, Automate workflows

Paragon Insights

Correlate using AI/ML analytics to provide actionable insights (formerly Healthbot)

Paragon Active Assurance

Actively validate service quality (formerly Netrounds)

Paragon Automation On-Prem & SAAS in 2021

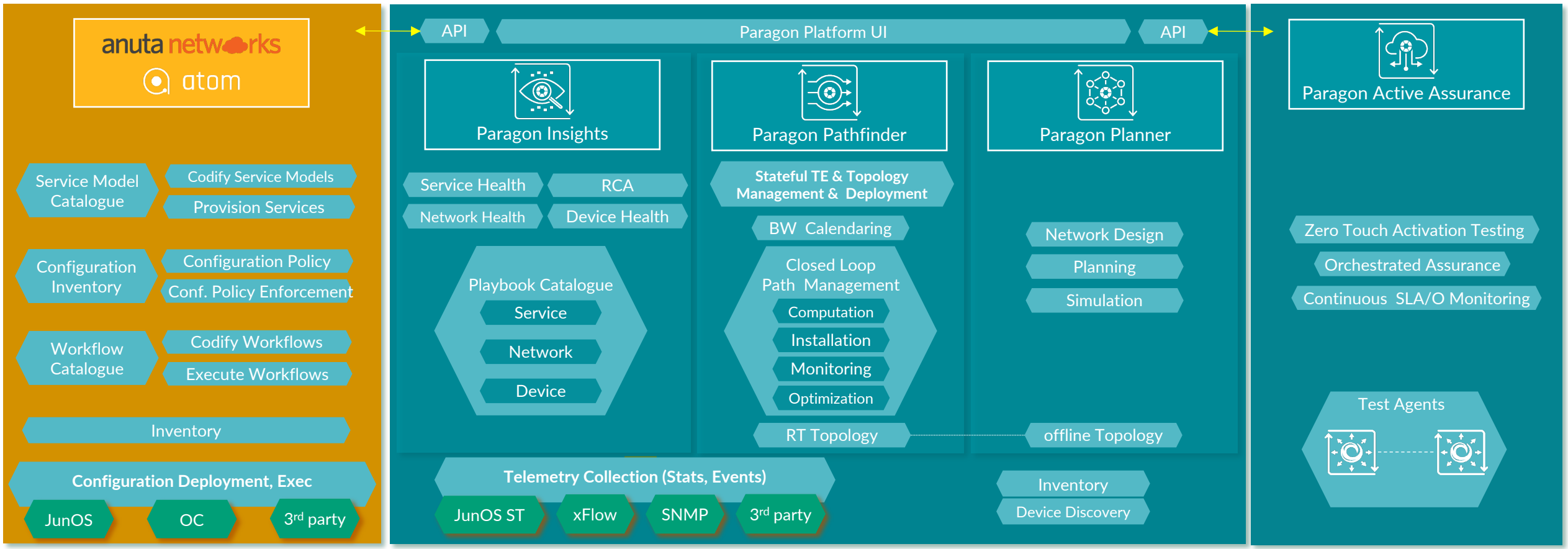
On-Prem | *SAAS/On-Prem*

Device Lifecycle Management Service Lifecycle Management

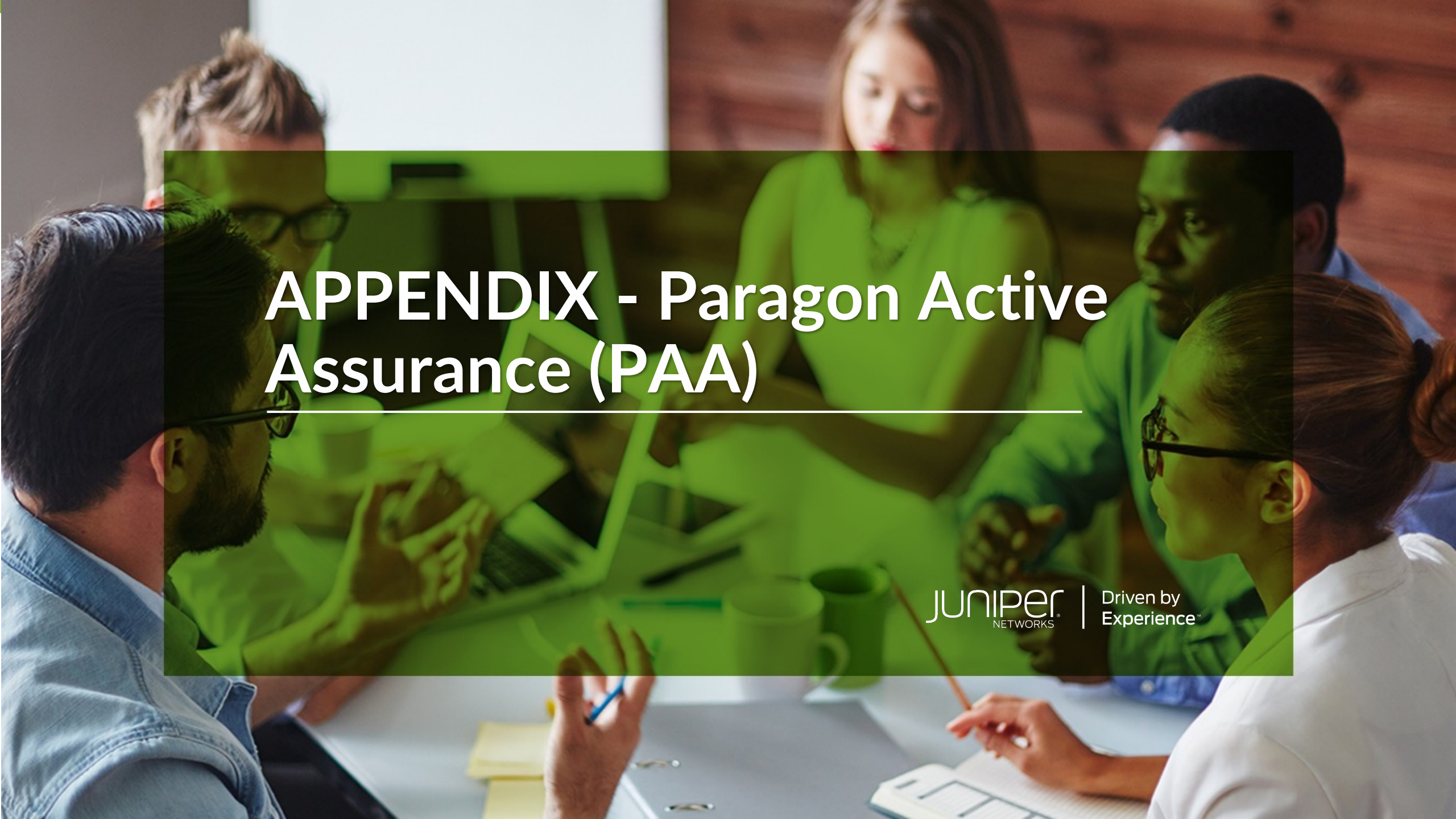
Service, Network, Device Health

IP Transport Planning & Management

Active Assurance through synthetic traffic




Thank you
JUNIPER NETWORKS
Driven by Experience™



APPENDIX - Paragon Active Assurance (PAA)

Juniper Networks | Driven by Experience™

Business Benefits

Service Lifecycle

Change/Delivery – Day 1

- Deliver pre-assured services
- Confirm new configurations – right first time
- Validate changes – ensure nothing breaks

Operations/Service Desk – Day 2

- Understand performance issues before users
- Shorter time to resolve problems
- Confirm that network service levels support business objectives

ROI

13% reduction in failed service delivery rate

Reduction in incident resolution times

Faster time to revenue - billing commences ~6 days earlier for new services

8% lower OPEX for service delivery

No services placed into production have **performance issues**

Increased customer satisfaction

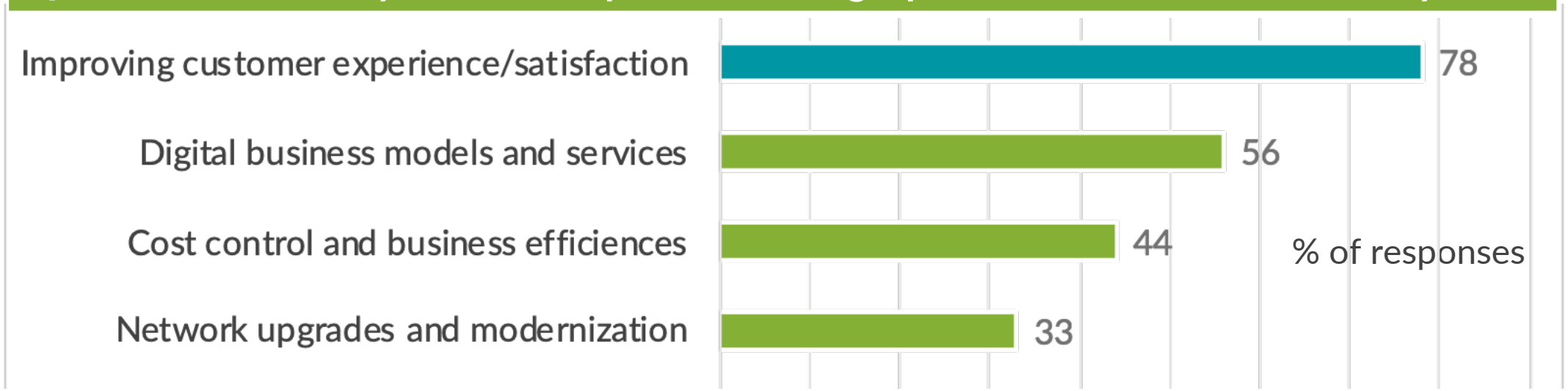
Day 1 Activation Testing

Day 2 Active Monitoring

Note: ROI statistics from Netrounds' customers

Experience a Top Priority for Service Providers

Question: What are your most important strategic priorities over the next three years?



Source: Ernst & Young Global Telecommunication study 2019.

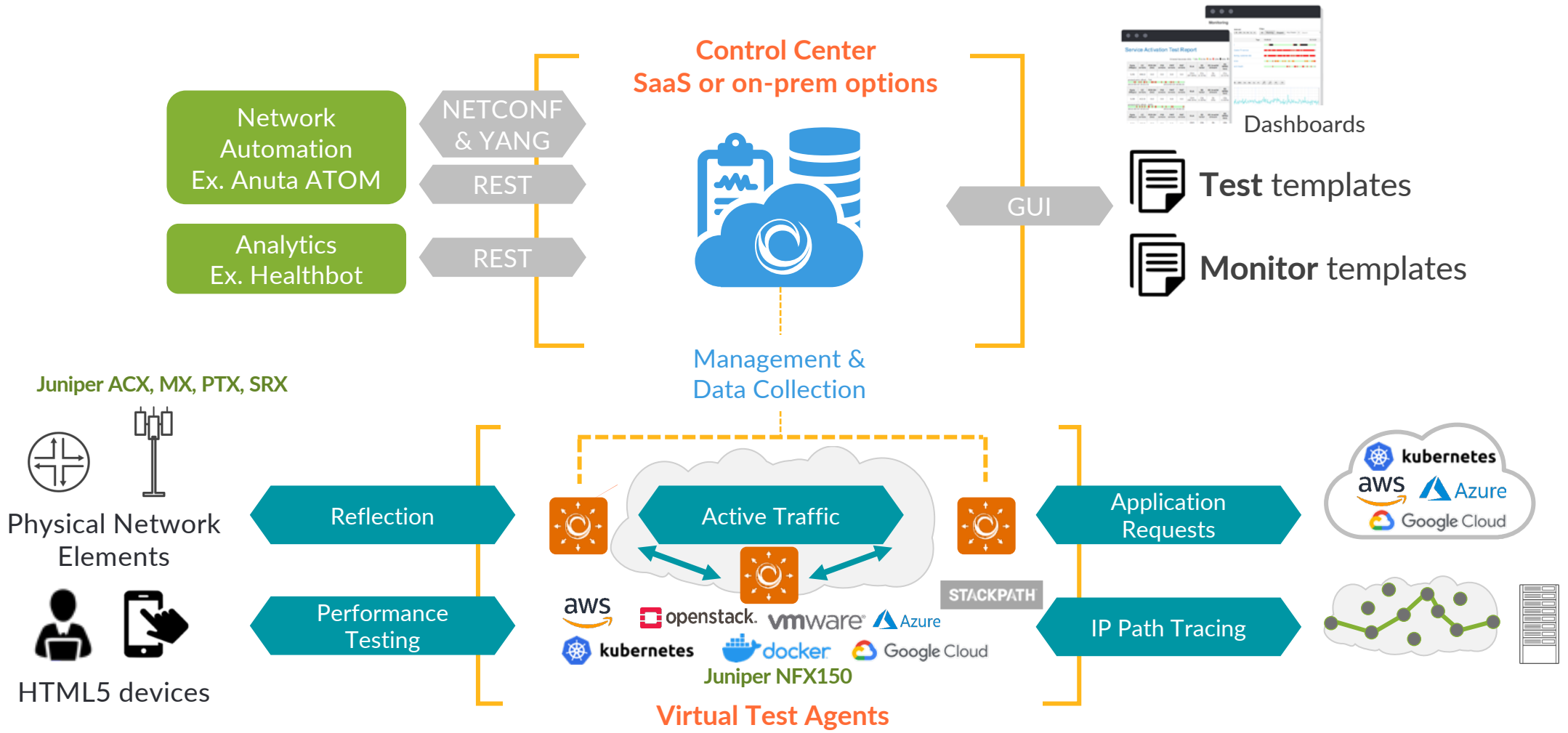
"We need to invest in the customer because of disruptive competition."

—Operator survey participant

"Our industry is plagued by churn levels that would terrify any other industry."

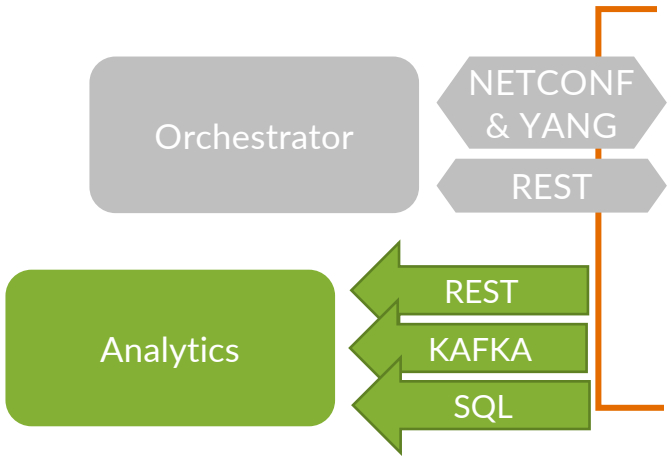
—Operator survey participant

Architecture



SaaS or On-premises – Supporting Public, Private or Hybrid Environments

Automation features/APIs



Control Center

Swagger/OpenAPI

Test Agents

- Multiple different image formats
- Support for all major public cloud environments
- PNF, VNF and CNF
- VNF: Support for cloud-init
- CNF: Certified to run on Open Shift
- “Call home” functionality

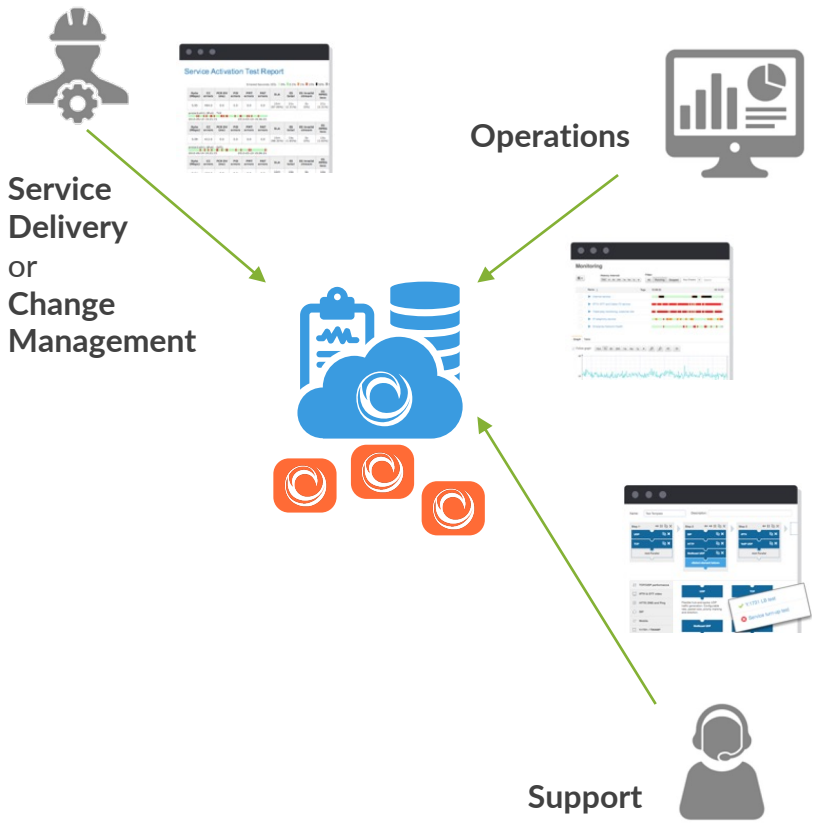
L2-L7 Data Plane Metrics in One Platform

WI-FI	MOBILE	NETWORK PERFORMANCE	IPTV & OTT VIDEO	VOICE	INTERNET PERFORMANCE	REMOTE PACKET INSPECTION
SWITCHER	SWITCHER	UDP	IPTV	SIP	DNS	PACKET CAPTURE
LOGGER	LOGGER	*Y.1564/MEF 48*	*ETSI TR 101 290*	*REGISTER*	*RESPONSE TIME*	*LIVE FEED*
SCAN		*UNI/ MULTICAST*	*MULTI-CHANNEL*	*CONNECT*	*EXPECTED RESPONSE*	*PCAP FILES*
		P2P/ HUB-AND-SPOKE/ FULL-MESH	*IGMP JOIN/LEAVE*	*DISCONNECT*	*WIDE RECORD TYPE SUPPORT*	*WIRESHARK COMPATIBLE*
		STATEFUL TCP	*INLINE*	*CALL STATISTICS*	HTTP	
		RFC 6349	HTTP/OTT STREAMING	*MOS*	*TCP CONNECT*	
		MULTI-SESSION TCP	*APPLE HLS*	VOIP UDP	*TIME TO FIRST BYTE*	
		QOS POLICY PROFILING	*PLAYBACK RATE*	*G.711/G.723/G.729/ GSM-EFR*	*PAGE LOAD*	
		REFLECTOR	*DOWNLOAD RATE*	*MOS*	*DOWNLOAD RATE*	
		Y.1731 – LB/DM/SLM	*BUFFER*		HTML5 TESTS	
		802.1AG – LOOPBACK	NETFLIX		*RATE, RESPONSE TIME*	
		RFC 5357 – TWAMP FULL/ LIGHT	*NETFLIX SPEEDTEST*		*LATENCY, JITTER*	
			DOWN-/UPLOAD RATE		PING	
					ICMP, UDP	
					PATHTRACE	

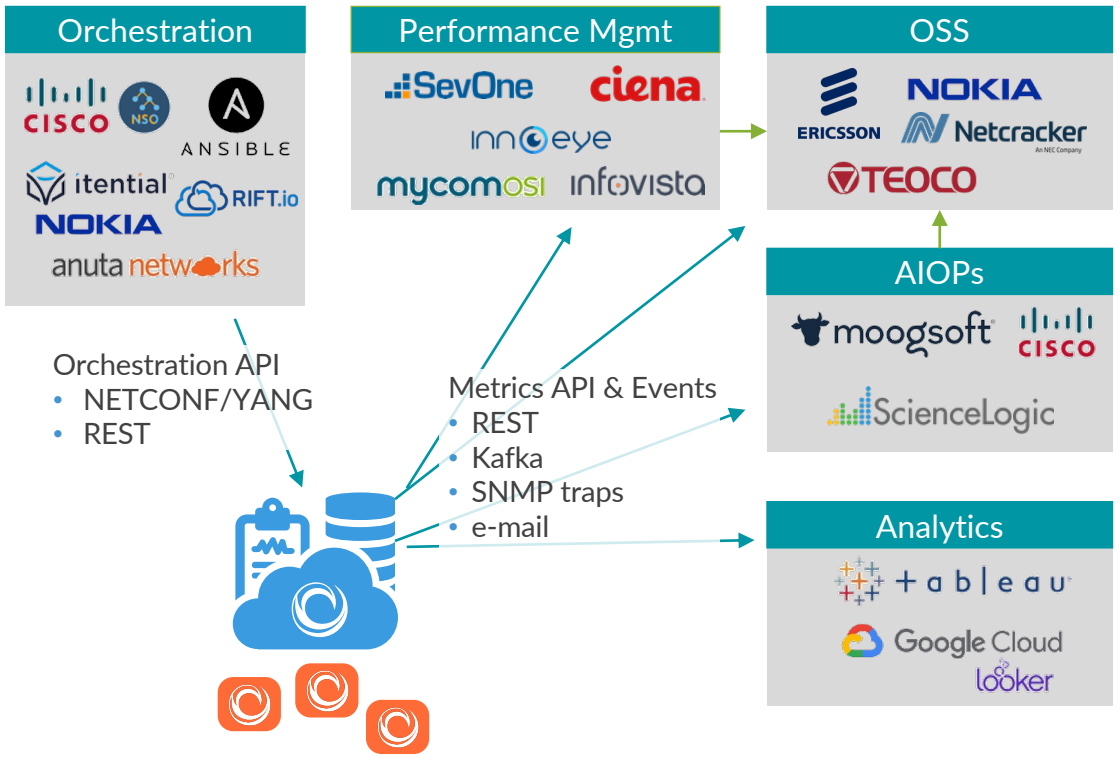
Test & monitor templates used for automation and to structure measurements in flexible order and combination

Proven Across All Operational Environments

Stand-Alone in Today's Networks



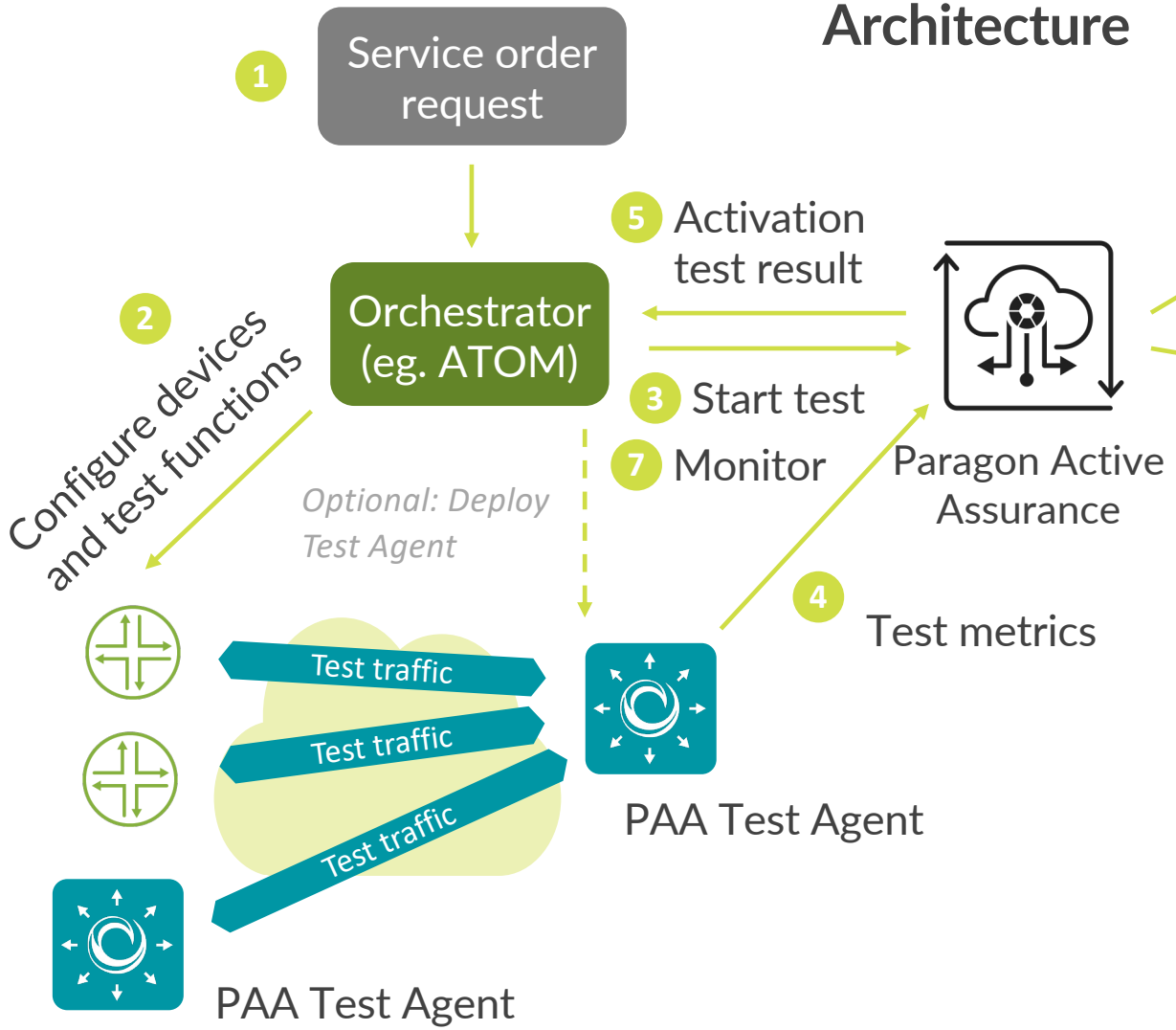
Fully Orchestrated Networks & Services



Example integrations - not a comprehensive list

Example automation workflow

Architecture



Outcome

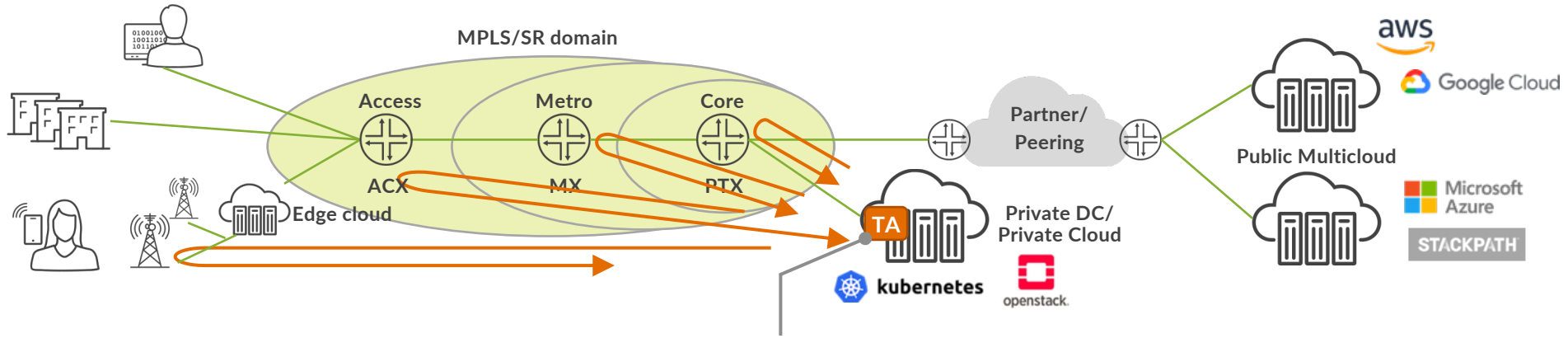
6 Service activation test reports

8 Real-time service quality dashboard

Customer Use Cases

JUNIPER NETWORKS | Engineering Simplicity

Central TWAMP for Backhaul Network Performance



Customer example:

orange™

Two options for Test Agent deployment in private data center:

1. As VM or Container on existing compute infrastructure
2. Stand-alone on dedicated Juniper NFX150

TA Netrounds Active Test Agent Software as VM or Container

Active reflecting traffic using TWAMP

Pain points

- Undetected problems
- Problems difficult to find – long MTTR

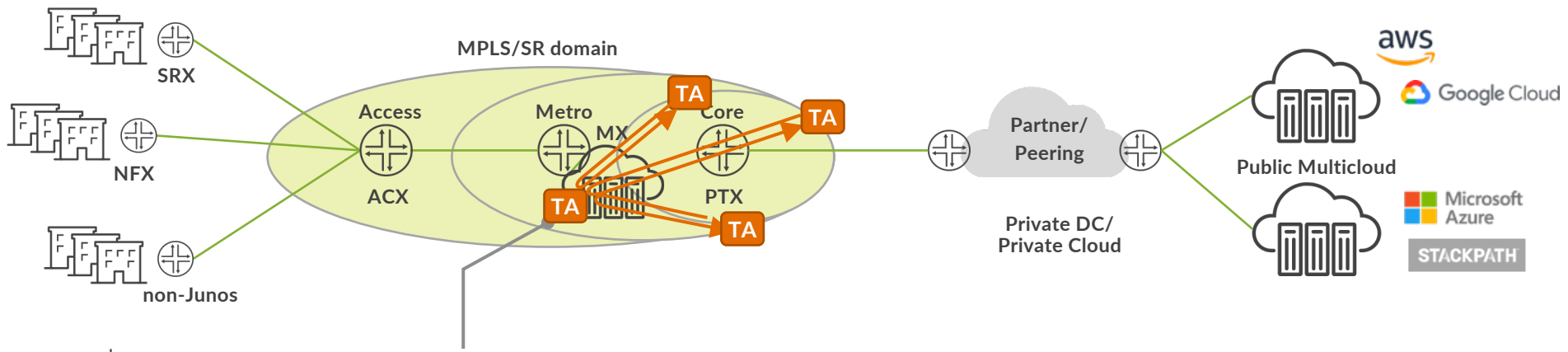
Underlying reasons

- Lack of visibility
- Misconfigurations (QoS)
- Bursty traffic patterns

Solution

- Validate QoS policies
- Test that that changes do not break anything
- Sectionalize and pinpoint problem area

Core Network Performance



Customer example:

telenor

Test Agent deployment on metro sites

1. As VM or Container on existing compute infrastructure
2. Stand-alone on dedicated Juniper NFX150 (shadow routers)
3. On Provider Edge router (roadmap item)

TA Netrounds Active Test Agent Software as VM or Container

Active reflecting traffic using e.g., TWAMP

Pain points

- Core router performance from end user perspective (IP, IPTV etc)
- Routing and forwarding issues
- Planned work

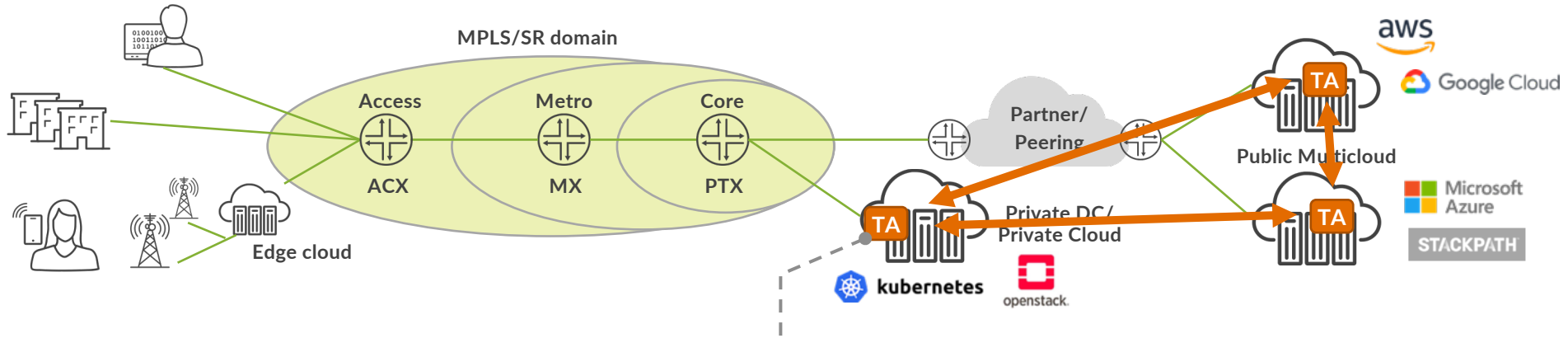
Underlying reasons

- Complex network designs
- Node monitoring does not reveal all possible errors (e.g., how route changes affect forwarding)

Solution

- Automated testing, performed at changes
- Active test traffic on the data plane to continuously detect and sectionalize when and where issues occur

Multi-Cloud and Data Center Interconnect



Customer example:

Telefónica

Two options for Test Agent deployment in private data center:

1. As VM or Container on existing compute infrastructure
2. Stand-alone on dedicated Juniper NFX150

TA Netrounds Active Test Agent Software as VM or Container

Multi-layer, multi-QoS L2-L7 active traffic

Pain points

- Intermittent outages and quality degradations
- Many parties involved – long MTTR

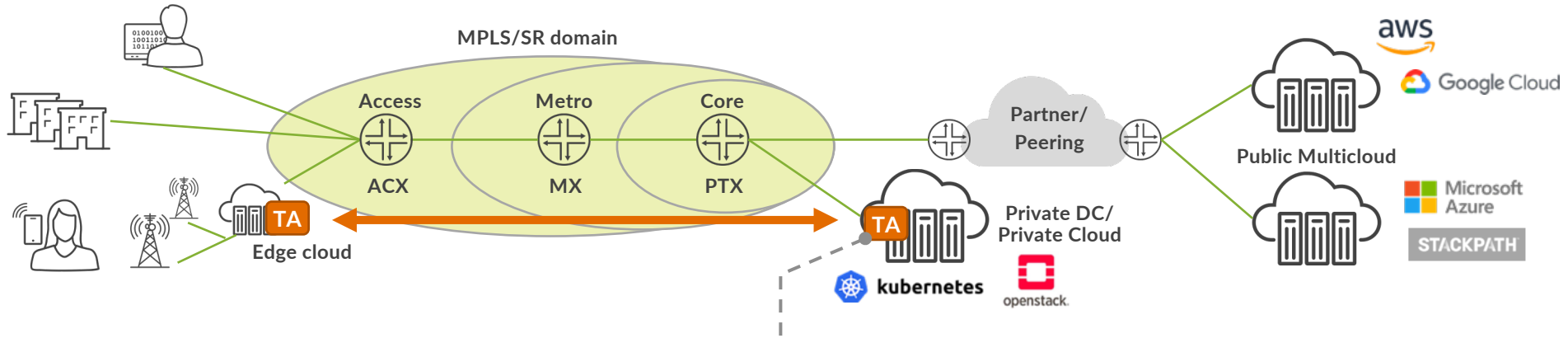
Underlying reasons

- Dependent on public Internet and other shared infrastructure
- Limited or no visibility into public cloud networking
- Complex routing and security policies between clouds

Solution

- Active test traffic to validate actual end-to-end quality
- Continuous detection of when and where issues occur
- Rapid, efficient and cloud-agnostic troubleshooting

5G Edge Slicing and Cloud Network Performance



Customer example:

Rakuten Mobile

Two options for Test Agent deployment in private data center:

1. As VM or Container on existing compute infrastructure
2. Stand-alone on dedicated Juniper NFX150

TA Netrounds Active Test Agent Software as VM or Container

Multi-layer, multi-QoS L2-L7 active traffic

Pain points

- Escalations from mobile customers due to poor performance
- Problems difficult to find – long MTTR

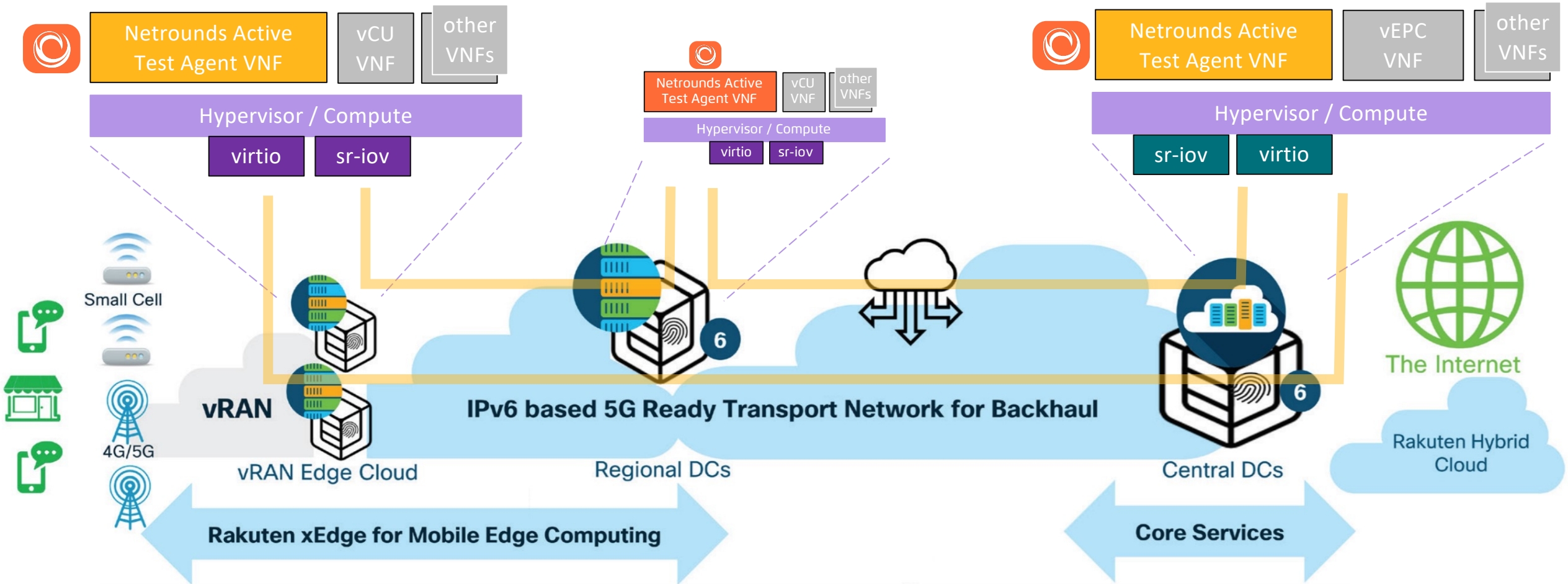
Underlying reasons

- Very complex, multiple overlay network, with limited visibility
- Dynamic nature of cloud native renders traditional device assurance not applicable

Solution

- Active test traffic on the data plane
- Validation of network data plane, embedded in CI/CD process
- Continuous detection and sectionalization of when and where issues occur

Distributed Computing Enables Active Assurance



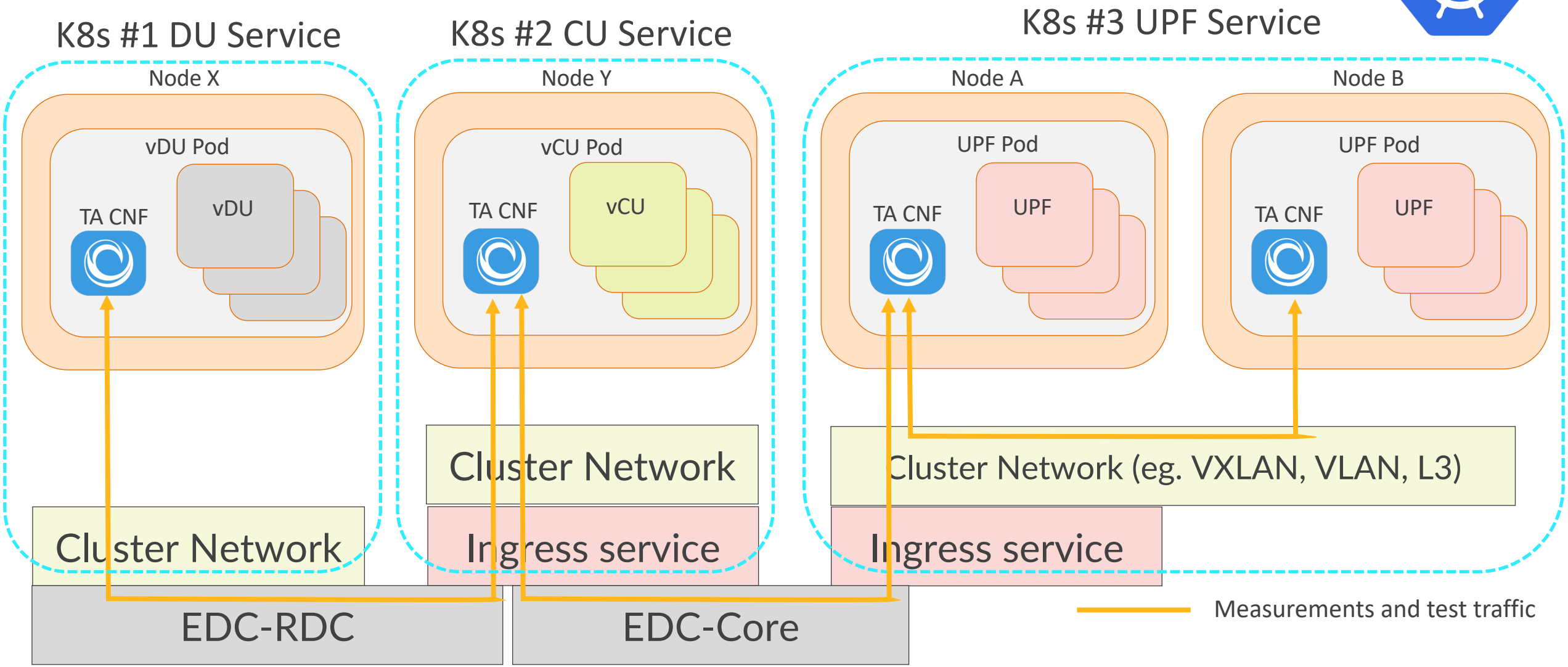
Source: Reimagining the End-to-End Mobile Network in the 5G Era

Metrics

- One-way latency / jitter
- Packet loss / reordering
- Throughput

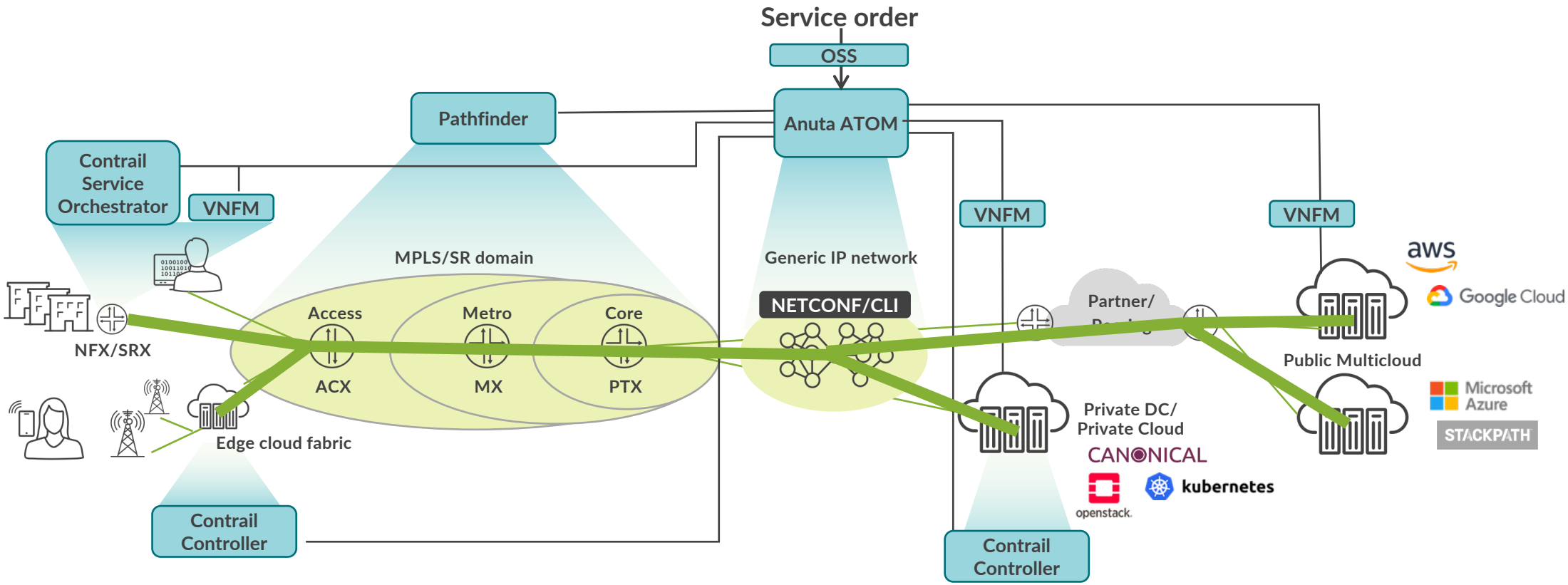
active IPv6 traffic across the data plane in 3x QoS (BE, AF41, EF)

K8s Combined Assurance for CNF 5G stack



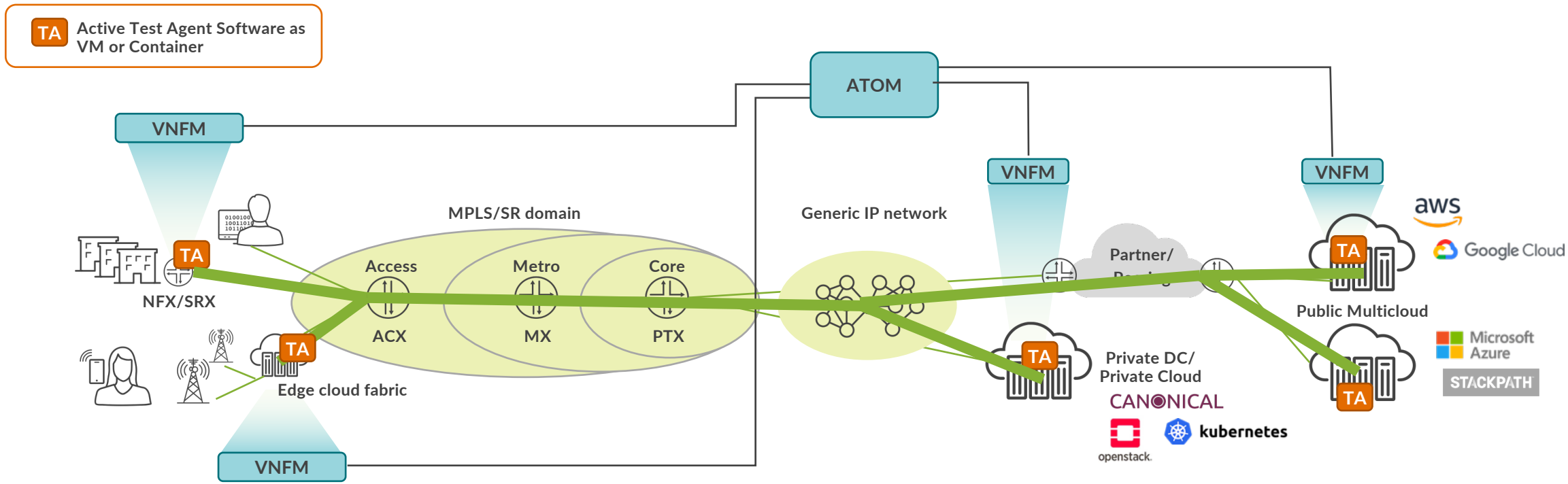
Deploying and Invoking Fully Orchestrated Active Assurance

Step 1: E2E Service Provisioning



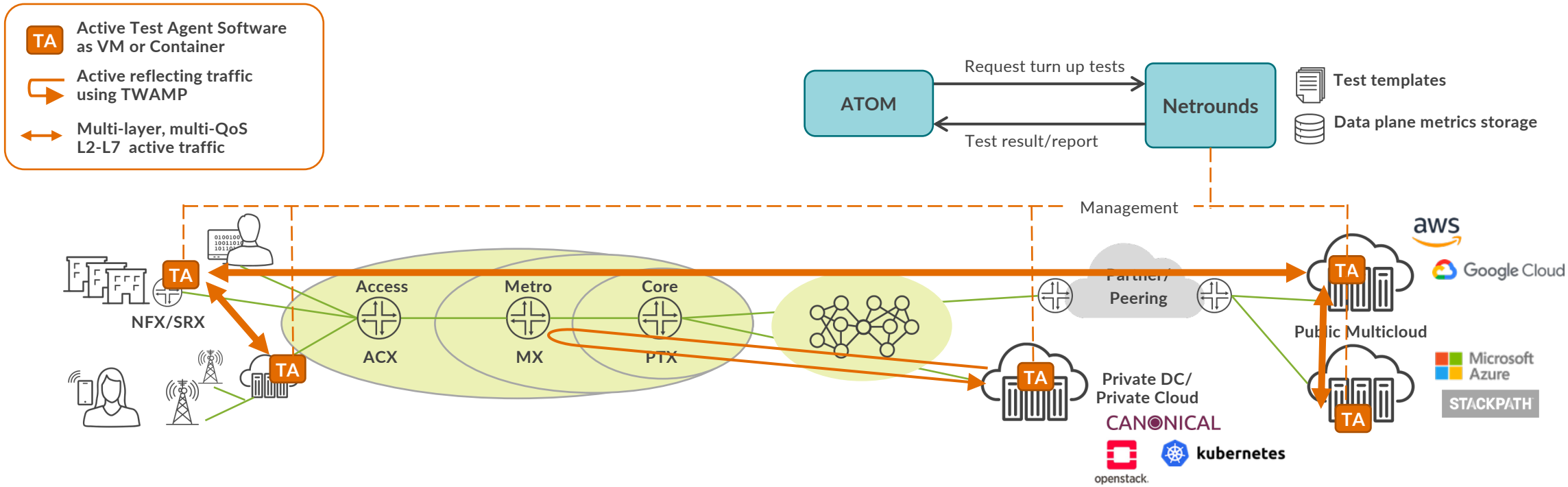
Anuta transforms inbound service order to network configurations to fulfill requested intent.

Step 2: Orchestrated Test Agent Deployment Using VNFMs



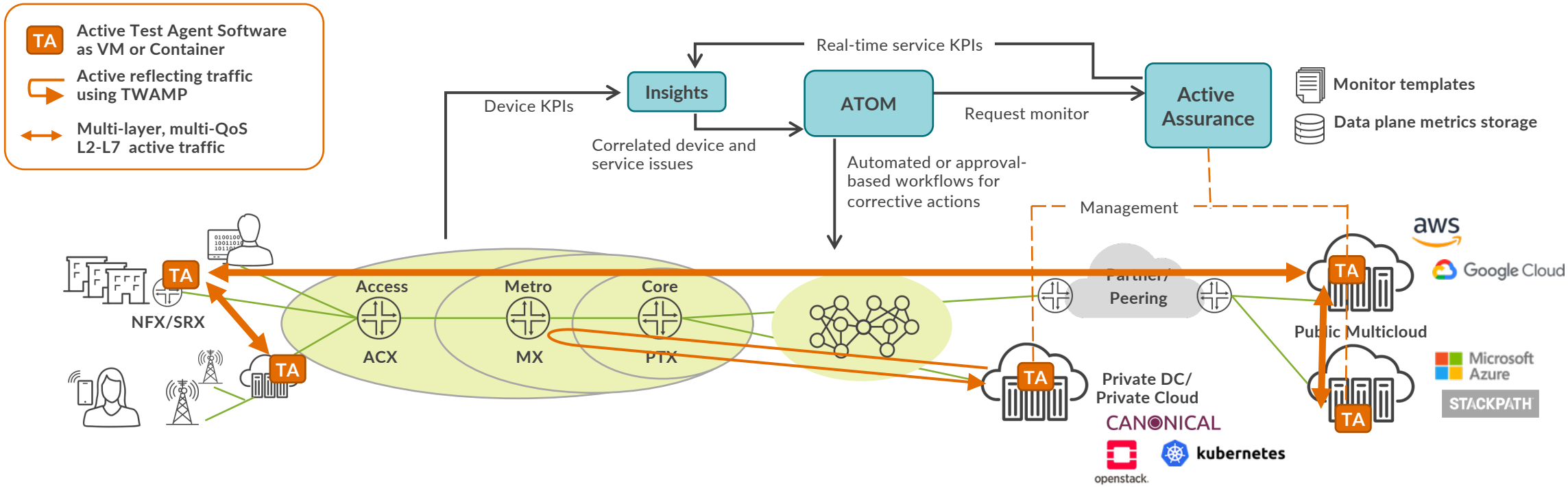
As specified in service chain or slice descriptors, ATOM deploys active Test Agents on compute nodes connected to the E2E service

Step 3: Orchestrated Turn-Up Testing



ATOM requests service turn-up validation from PAA, by referring to a pre-defined test template.
If OK, ATOM starts service monitoring using pre-define templates, otherwise service config is rolled back.

Step 4: Service-Oriented Closed Loop with Paragon Insights



Paragin Insights concludes root cause candidate devices by using playbooks to correlate device-centric KPIs with service-oriented KPI from Paragon Active Assurance