MOBILE SERVICE ASSURANCE

Differentiate and guarantee mobile services end to end with Active Assurance

Challenge

Incomplete and inadequate service validation creates frustration for subscribers, damaged reputations, and churn. Mobile operations teams must pivot from focusing on the infrastructure to actively measuring the service quality to validate service levels and meet customers' service-quality needs.

Solution

With Paragon Active Assurance, operations can transform from monitoring devices and infrastructure only, to understanding the quality of network services. This gives service operations a highly effective way to identify, understand, troubleshoot, and resolve issues before they impact services and customer experience.

Benefits

- *Understand customer experience from an end-user perspective*
- *Guarantee service quality*
- *Resolve problems more quickly*
- *Locate and fix performance issues before customers are impacted*
- *Know changes are made right the first time and all the time*
- *Confirm that network service levels support business objectives*

Solution Brief

The heightened assurance demands of the 5G era are upon us and mobile network operations are evolving. New 5G network slices and industry verticals put requirements on different key performance indicators (KPIs) that are needed to guarantee unique service-level agreements (SLAs). 5G application SLAs may be focused on various service objectives, including high bandwidth, high availability, and ultra-reliable low latency.

With Juniper® Paragon™ Active Assurance, mobile operations teams can continually measure and monitor what truly matters when dynamically provisioning services and slices—the quality of end-to-end services and slices from an end-user perspective. This visibility enables network automation to proactively prevent issues from occurring before they impact customers, and it gives operators a toolset to rapidly locate problems when they do arise.

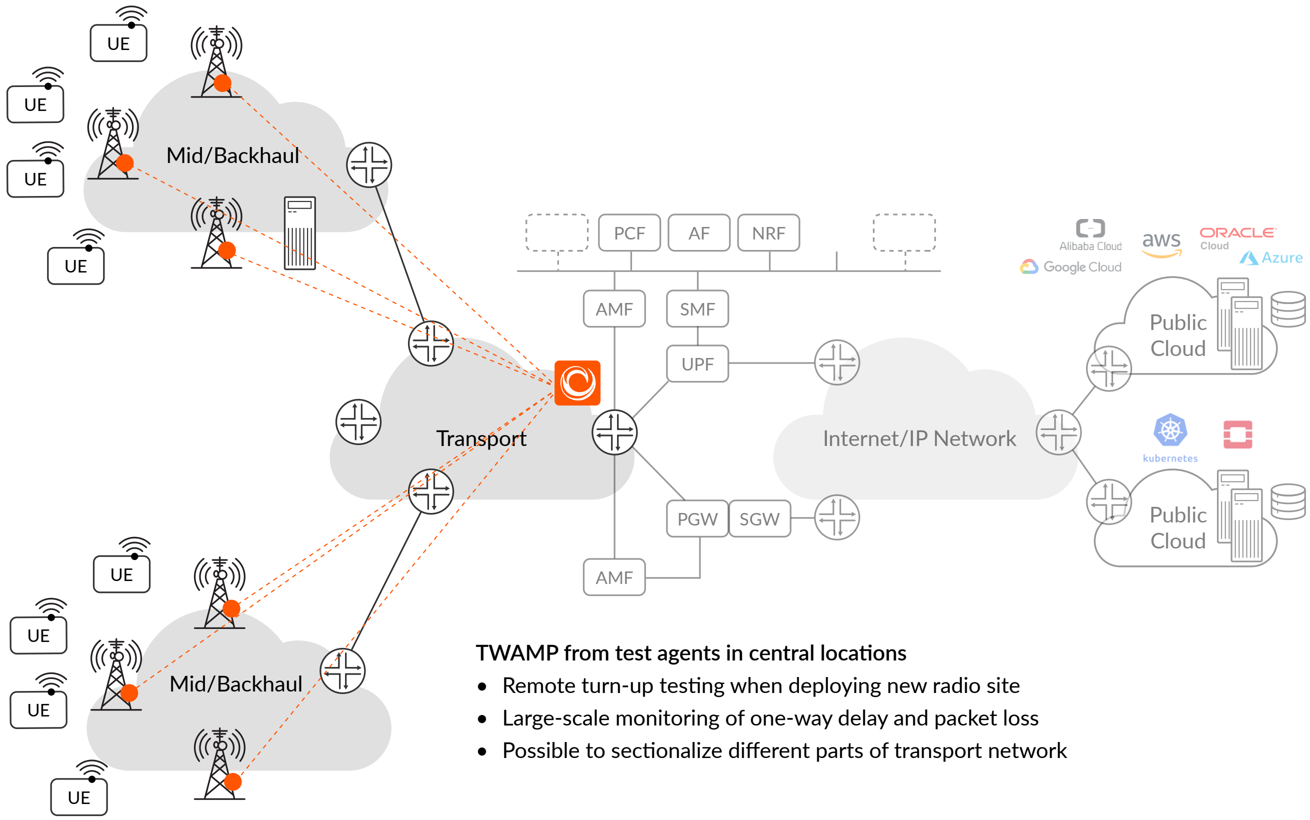
The Challenge

The 5G era is upon us, and there is an industry consensus that network automation and a new mobile service assurance model for 5G networks are paramount to achieving the level of experience that customers expect today. Service operations, IT, and operational support systems (OSS) are set for making this transition. To be a 5G leader, it's crucial to evolve mobile operations and assurance requirements to differentiate service quality and the customer experience.

The Juniper Networks Mobile Service Assurance Solution

Paragon Active Assurance for 5G networks was built to solve the problem of improving SLA assurance of end-to-end 5G mobile services through all the network domains that connect the service. It measures service quality from distributed radio access network (RAN) to transport (including partner networks) and into the 5G core. It also covers the data center service chains connecting cloud applications, whether in private clouds or on a public cloud platform like Amazon Web Services, Microsoft Azure, or Google Cloud.

The Mobile Service Assurance solution deployed in the transport network or edge cloud can cover an entire region interconnecting the RAN with the core (Figure 1). Reflection testing, using L2 and L3 test standards such as Y.1731 and Two-Way Active Measurement Protocol (TWAMP), can be deployed to validate performance between base stations and the agent. For distributed 5G RANs, the solution has more advanced options (see the Solution Components section below).



TWAMP from test agents in central locations

- Remote turn-up testing when deploying new radio site
- Large-scale monitoring of one-way delay and packet loss
- Possible to sectionalize different parts of transport network

Figure 1: A single active test agent covering a region interconnecting the RAN with the core

Features and Benefits

The Mobile Service Assurance solution delivers the following capabilities and business benefits.

Capability	Requirements
Centralized test and API monitoring	Network automation frameworks and orchestrators can leverage active assurance.
Coverage of the full operational life cycle	Operators avoid complex integrations of multiple-point solutions, while combining turn-up testing, ongoing real-time active monitoring, and trouble-shooting into a single solution.
Zero-touch dynamic deployment	Active test agents, either containers or virtual machines (VMs), are instantiated automatically as part of service or slice creation.
Small footprint and minimal resource requirements	Operators only allocate a fraction of available resources, especially at edge locations where there is a limited amount of compute and storage. (Solution consumes only a single vCPU and executes in a few hundred MBs of RAM.)
Measurement through the 5G data plane	Active test agents send traffic through the 5G data plane. Traffic is encapsulated in the GPRS tunneling protocol (GTP) tunnel and traverses the network slice the same way as mobile phone (user equipment) traffic does.
Service chains com-patibility	The test agent supports flexible networking so that it can act as a small virtualized network function (VNF) in the service chain. In this way, operators gain full visibility into the data plane traversing individual VNFs in the service chain, as well as the complete service chain data plane KPIs.
Multilayer, L2-L7	The solution isolates issues with different protocol layers from the link layer (L2) to the application layer (L7).
Performance at scale	Thousands of active test agents can be deployed wherever there is compute available. You can scale each active test agent to thousands of concurrent parallel streams or sessions to support use cases based on reflection technologies (TWAMP, Y.1731, UDP Echo, ICMP Echo) toward existing network elements.
Accurate timestamp-ing and high resolution	One-way delays are confirmed in mid-haul networks, measured with sub-millisecond accuracy and precision. Uses hardware timestamping on physical network interfaces.
IPv6-only support	Environments where only IPv6 is available are supported.

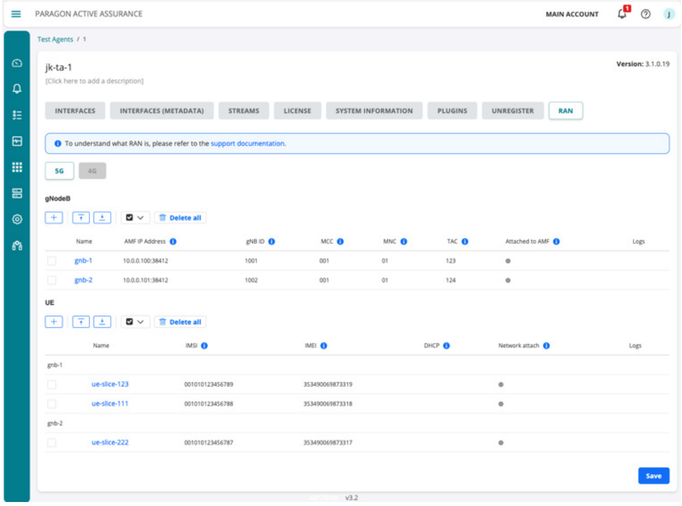
Solution Components

Mobile Service Assurance can be implemented in your network by integrating Paragon Active Assurance with your existing network and service assurance solution.

The core component of Paragon Active Assurance is a cloud-ready multitenant Control Center, which provides a user-friendly Web portal GUI where operations staff can run on-demand tests and view real-time and aggregated results as well as KPIs and SLA monitoring metrics. The Control Center includes a feature-rich API, allowing external OSS and Network Functions Virtualization (NFV) orchestrators to easily automate distributed activation tests or monitoring scenarios.

The Control Center remotely controls software-based and traffic-generating test agents, which provide distributed measurement metrics. It also displays detailed, real-time results and statistics actively measured by test agents and reflector streams across multiple applications, services, and interfaces.

Test agent capabilities include service activation (Y.1564, MEF 48), network performance (UDP, TCP, Y.1731, TWAMP, path trace), Internet performance (HTTP, DNS), and rich media (IPTV, OTT video, and VoIP telephony with or without SIP signaling), as well as support for controlling Wi-Fi interfaces and remote packet inspection.



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[Click here to add a description]

Version: 3.1.0.19

To understand what RAN is, please refer to the support documentation.

gNodeB

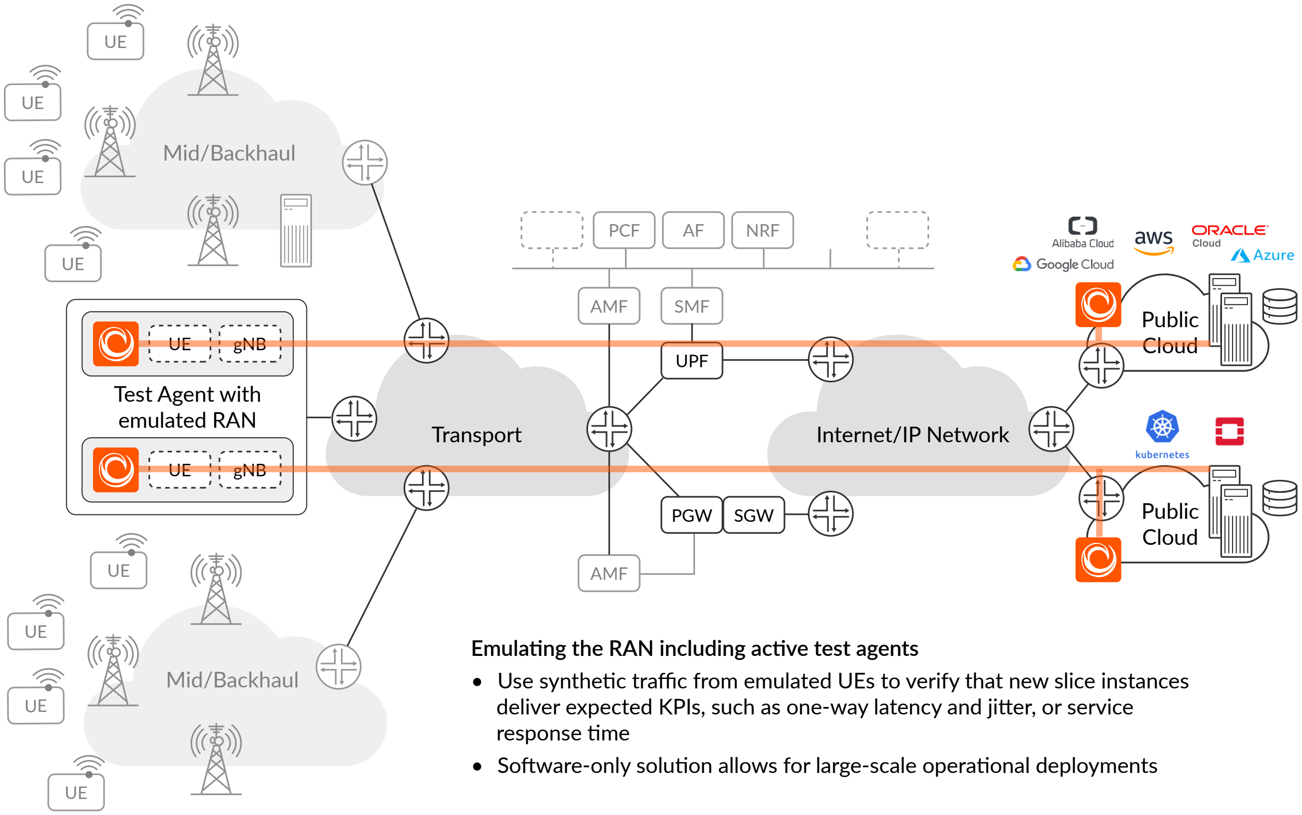
	Name	AMF IP Address	gNB ID	MCC	MNC	TAC	Attached to AMF	Logs
□	gnb-1	10.0.0.100:38412	1001	001	01	123	●	
□	gnb-2	10.0.0.101:38412	1002	001	01	124	●	

UE

	Name	IMSI	IMEI	DHCP	Network attach	Logs
gnb-1						
□	ue-slice-123	001010123456789	353490069873319		●	
□	ue-slice-111	001010123456788	353490069873318		●	
gnb-2						
□	ue-slice-222	001010123456787	353490069873317		●	

Figure 2: Configuring active test agents with emulated 5G user equipment/gNodeBs

Test agents can also be used to emulate the 5G mobile user equipment and 5G new gNodeB base station (Figure 2) to inject synthetic traffic encapsulated in a GTP tunnel (or even IPsec over GTP) across end-to-end 5G services (see Figure 3). This solves the problem of testing from the RAN into the 5G core functions, Access and Mobility Management Function (AMF), Session Management Function (SMF), User Plane Function



Emulating the RAN including active test agents

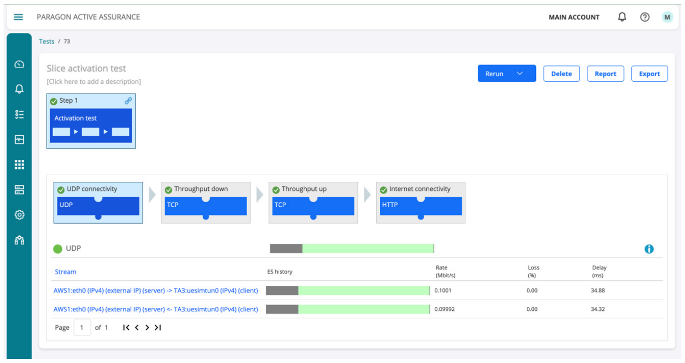
- Use synthetic traffic from emulated UEs to verify that new slice instances deliver expected KPIs, such as one-way latency and jitter, or service response time
- Software-only solution allows for large-scale operational deployments

Figure 3: Leveraging synthetic traffic from emulated 5G user equipment/gNodeBs

(UPF), and so on from the Third-Generation Partnership Project (3GPP) 5G services-based architecture, Today, that testing needs to be done using expensive drive testing processes that are measured through the radio interface. Manual drive testing is needed for radio coverage measurements, but it is not suitable for dynamic, on-demand testing as part of slice activation and operations.

Test agents may be deployed in strategic locations across your network for continuous quality monitoring. They may also be deployed on demand for temporary purposes, such as activation testing of newly deployed mobile services and slices. Test agents are available in several formats—as software to be run as a virtual machine on a hypervisor, as a container application, or as a software appliance for installation on dedicated x86 hardware. They are also available for all public clouds.

The Paragon Active Assurance software-only approach to flexible and programmable assurance makes the solution suitable for physical, hybrid, and virtual environments—either on-premises or in distributed edge clouds or centralized clouds (whether private or public). This provides a mobile service assurance solution that is suitable for any 4G or 5G mobile network topology and use case today, as well as for dynamic, software-driven networks.



Slice activation test

[Click here to add a description]

Stream	ES history	Rate (Mbit/s)	Loss (%)	Delay (ms)
AWS1:eth0 (IPv4) (external IP) (server) -> TA3:uesimtun0 (IPv4) (client)		0.1001	0.00	34.88
AWS1:eth0 (IPv4) (external IP) (server) <- TA3:uesimtun0 (IPv4) (client)		0.09992	0.00	34.32

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Figure 4: 5G network slice activation test template builder

Summary—Measure What Matters

With Mobile Service Assurance through Paragon Active Assurance, you can effectively differentiate and guarantee mobile services end-to-end from distributed 5G RAN to 5G core and through data center service chains connecting cloud applications. The solution enables you to measure what matters directly by performing active testing using synthetic L2-L7 traffic on the data plane, delivering true mobile service performance visibility from an end-user perspective. Mobile network operations teams gain a highly effective solution to identify, understand, troubleshoot, and resolve issues before they impact services and customer experience.

Proven in over 200 customer deployments worldwide, Paragon Active Assurance is already in production with many mobile operators. Leverage the solution within the full Juniper Paragon Automation Portfolio for automation across the entire network life cycle and transform customer experiences.

Next Steps

- Read our white paper on "Key considerations for assuring differentiated, end-to-end 5G services."
- Learn more Service-Centric Operations with Active Assurance in the 5G era.
- See our Juniper Paragon Active Assurance datasheet for product information.
- Contact your Juniper account representative to schedule a demo today!

About Juniper Networks

At Juniper Networks, we are dedicated to dramatically simplifying network operations and driving superior experiences for end users. Our solutions deliver industry-leading insight, automation, security and AI to drive real business results. We believe that powering connections will bring us closer together while empowering us all to solve the world's greatest challenges of well-being, sustainability and equality.

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