Cisco Provider Connectivity Assurance User Experience

Contents

Leveraging advancements in Artificial Intelligence and Machine Learning (AI/ML), Cisco® Provider Connectivity Assurance (PCA) has extended its network monitoring capabilities to enhance the Quality-of-Experience (QoE). **PCA User Experience (PCA UE)** enables real-time, comprehensive visibility into network performance through the lens of the customers. Designed to support all types of networks—wireline, terrestrial wireless, and nonterrestrial—PCA UE provides actionable insights per user, per application, and per network element.

PCA UE extends beyond network visibility by providing actionable insights to improve customer experience during congestion and reduce Radio Access Network (RAN) energy waste dynamically for underutilized cells. It matches data plane and control plane information at the point of collection, so when data is inserted into the PCA data lake it is immediately ready to be consumed by network, operations, and performance teams. PCA UE data records are specifically ingested, cleaned, and transformed for AI/ML model training.

PCA UE enhances network performance and strengthens overall network resiliency, improving both performance and reliability. These advancements lead to reduced Operational Expenses (OpEx) and less reliance on heavy Capital Expenditures (CapEx), allowing service providers to do more with fewer resources.

By improving network performance and user experience, PCA UE not only addresses existing challenges but also equips service providers to thrive in an increasingly complex and competitive network landscape, positioning them for long-term growth and innovation.

Product overview

PCA UE addresses consumer QoE through three key offerings:

- **Network Intelligence** captures end-to-end user experience data with granular detail (per flow, cell, application, and user). It identifies and characterizes all traffic types and encapsulations (Quick UDP Internet Connections [QUIC], TCP, User Datagram Protocol [UDP], GPRS Tunneling Protocol (GTP), Multiprotocol Label Switching [MPLS]/Segment Routing [SR]/SR over IPv6 [SRv6]), supporting use cases like network performance monitoring, customer care, and CapEx planning. Data is processed in real time and accessible via the PCA dashboard.
- **Network Optimization** applies traffic shaping to elephant flows, boosting user throughput during congestion and providing instant cell site capacity relief, thus reducing the need for frequent spectrum upgrades. It also protects real-time traffic (e.g., videoconferencing, collaboration) from high bandwidth flows, preserving consumer QoE.
- **Energy Reduction** predicts which cellular network radios can be powered off based on real-time traffic demand without affecting user QoE. It sends energy-saving recommendations via API to the RAN controller, suggesting dynamic frequency band switching to optimize RAN energy consumption by redistributing users to fewer frequency bands.

Features and benefits

Table 1. Key benefits of PCA User Experience

Feature	Benefit
Consumer QoE	• Provides real-time traffic insights without probes and offers actionable recommendations. • Benchmarks customer QoE and identifies customers with insufficient QoE before they churn.
Monetization	• Provides deep insights into service provider network traffic (QUIC, TCP, UDP, GTP), driving new monetization use cases such as selling Fixed Wireless Access (FWA), converting consumers to higher-priced plans, recommending video upgrades based on usage, improving Net Promoter Score (NPS) for brand marketing, and leasing excess assets.
Reduced CapEx and OpEx	• Network Optimization delivers faster user speeds using existing hardware in both wireless and wireline networks. • Real-time congestion management reduces the need for frequent cell site upgrades, providing a cost-effective alternative to new RAN equipment and spectrum purchases and optimizing CapEx. • Increases cell site capacity by 40%, boosts average user throughput by 20% during congestion, and reduces CapEx and OpEx by 20%. • Proactively forecasts future cell site investment needs based on consumer Service-Level Agreements (SLAs).
Sustainability	• Efficient spectrum energization helps achieve sustainability and OpEx goals. • Energy Reduction delivers ~40% energy savings by using real-time consumer experience metrics to control spectrum energization with existing hardware.

Solution differentiation

PCA UE provides compact, actionable data with efficient AI-ready metrics, and is scalable with minimal back-end resources. This closed-loop solution correlates Consumer Experience (CX) metrics from each user IP traffic flow with RAN, mobile core, and customer plan data to optimize network performance and customer experience.

Solution overview

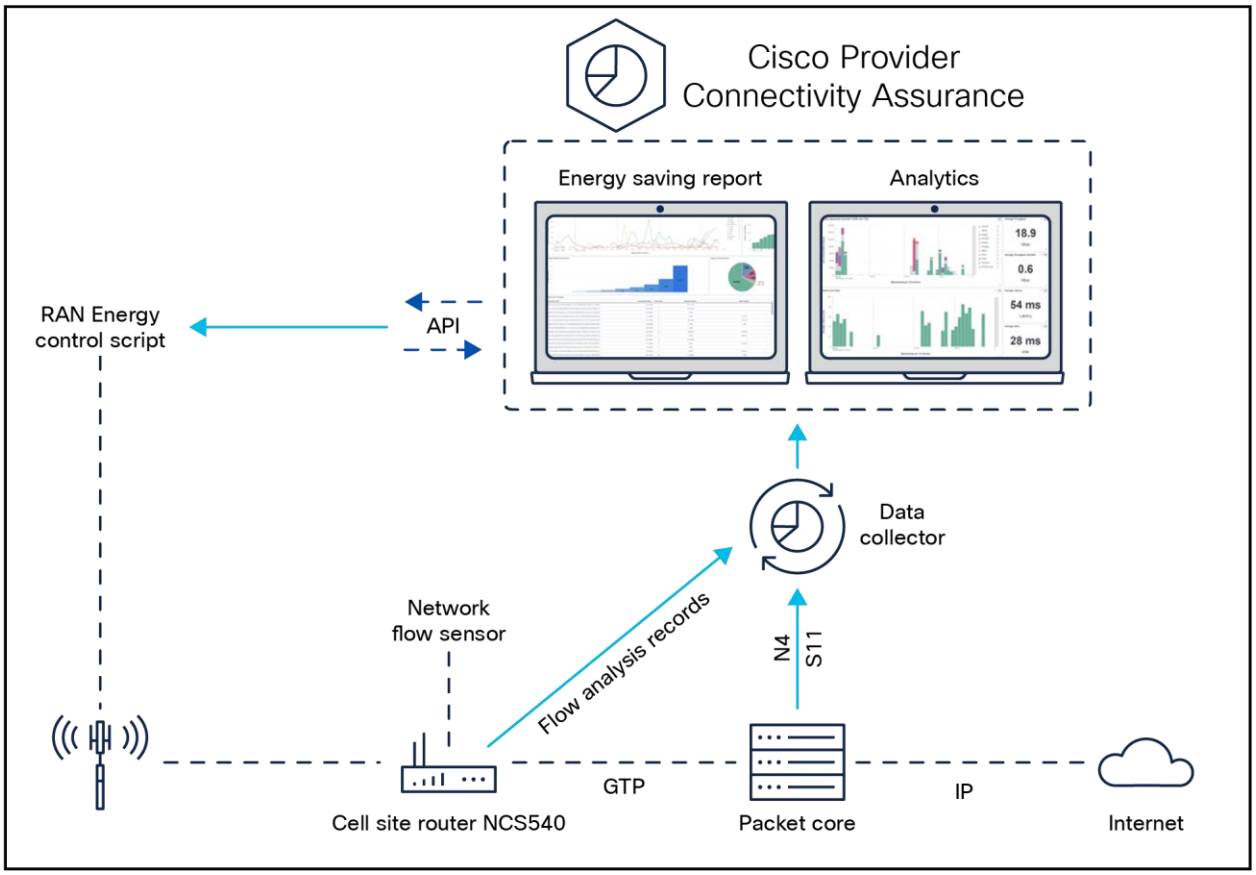

Figure 1.
High-level architectural topology

PCA UE consists primarily of two key elements:

- **Network flow sensor:** A Docker container hosting a software agent on a Cisco Cell Site Router (CSR).
- **PCA platform:** The router monitors the desired interface and sends packets via the Switched Port Analyzer (SPAN) to the network flow sensor. The sensor analyzes and characterizes traffic flows, exporting metrics to the data platform for visualization and analysis.

Supported router product IDs

Supported platforms

- N540-24Q2C2DD-SYS
- N540-24Q8L2DD-SYS
- N540(X)-ACC-SYS
- N540-24Z8Q2C-SYS
- N540X-16Z4G8Q2C-D/A
- N540-12Z20G-SYS-D/A
- N540X-16Z8Q2C-D

- N540-28Z4C-SYS-A/D
- N540X-12Z16G-SYS-D/A

We also offer a standalone solution for customers who do not currently have the Cisco CSR platforms deployed. PCA UE Standalone is a probeless solution that connects via SPAN from aggregation routers with connectivity supported through 10/25/40/100 Gbps interfaces.

Like the integrated router solution, the standalone solution comprises two components:

- **Network flow sensor:** The network flow sensor can be deployed back in the aggregation network on Cisco UCS® rack servers. A typical Cisco UCS deployment can scale up to 320 Gbps per server.
- **PCA platform:** In both the integrated and standalone offering, the PCA platform has two components:
  - PCA platform
    - Sensor management, central data ingestion, and an AI-driven analytics solution that can be deployed on the customer premises or hosted by Cisco.
    - System compute requirements vary based on the amount of data ingested and how long data is retained.
    - Please contact your Cisco account representative to get the appropriate sizing for your use case.
  - Data collector
    - The data collector supports collecting data over a variety of protocols and securely streaming to the PCA platform.
    - It is commonly deployed near the network flow sensors.

Table 2. Data collector requirements

Disk space	100 GB
CPU	4 CPU cores
Memory	2 GB RAM
Software	Docker 24.05 or later Debian 11 or CentOS 7.3 or higher

Licensing

PCA UE is available on an annual subscription basis, licensed per router.

Ordering information

Contact your Cisco account representative today for pricing and ordering information.

Cisco and partner services

Services from Cisco and our partners help you get the most value from the PCA UE solution, quickly and cost-effectively. In addition, we can help you:

- Solidify your vision
- Create a strategy
- Develop a roadmap
- Build a scalable design
- Strengthen your team by sharing what we know

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Reference links to information about key environmental sustainability topics (mentioned in the "Environmental Sustainability" section of the report) are provided in the following table.

Table 3. Links to sustainability topics

Sustainability topic	Reference
Information on product material content laws and regulations	Materials
Information on electronic waste laws and regulations, including products, batteries, and packaging	WEEE compliance

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More Information

Let's build the efficient network together

Working together, we can build a more efficient mobile network that delivers the finest customer experience possible. Start to improve network efficiency, not just build the bigger network. For additional information, visit Cisco Provider Connectivity Assurance.

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