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GUIDE

Deep Network Observability Improves 5G Mobile Subscriber User Experience

Key Results:

- 80% reduction in Deep Packet Inspection (DPI) hardware footprint and power usage
- Real-time monitoring of QoE and SLAs
- Cost optimization at every stage
- Seamless integration & interoperability

Business Problems to Be Solved

Organizations face multiple challenges in managing network observability and analytics due to fragmented systems, infrastructure changes, and increasing traffic demands. Key challenges include:

1. Fragmented Systems & High Costs

- Many existing systems can support similar objectives and functions, but they operate in silos, leading to inefficiencies.
- Lack of unified data processing increases complexity and operational costs.
- Consolidating systems is essential to reduce the operational burden and development expenses.

2. Integration with Existing Infrastructure

- A seamless solution is required to integrate effortlessly with existing **4G/LTE and 5G NSA/SA infrastructure, Cisco ACI Fabric for 5G-SA U-Plane** (encapsulated in IPv4 VXLAN), Mobile Core NFs for 5G-SA C-Plane (encapsulated in GRE), and Voice Networks (encapsulated in IPv6 VXLAN). Additionally, it must **support analytics tools leveraging Kafka** while ensuring consistent and reliable data processing, regardless of the captured signal.
- Standardizing data output specifications across all sources will improve interoperability and simplify operations.

3. Infrastructure Changes & System Dependencies

- Frequent changes in core network equipment create instability and increase repair costs.
- A system designed to be less dependent on changes in core equipment and capture points can enable faster operations and cost-effective maintenance.

4. Scaling for Increased Traffic

- With growing communication volumes, maintaining current data analysis capabilities is a challenge.
- The solution must ensure continuous analyzability or even improve data sampling rates without performance degradation.

5. End of Service Life (EOSL) & Frequent Upgrades

- Short EOSL cycles lead to frequent system upgrades, escalating development costs and operational overhead.
- A long-term, stable solution is required to minimize version upgrade frequency and ensure cost efficiency.

Addressing these challenges with a unified, scalable, and future-proof system will drive operational efficiency, reduce costs, and enhance network analytics capabilities.

Aviz Solution to Deliver Scalable and Efficient Network Observability

1. **Optimized Data Ingestion for Faster Insights**
   Aviz refined the data ingestion pipeline to ensure that compute-intensive Deep Packet Inspection (DPI) focuses only on relevant data (such as data points for QoE and SLAs). A two-stage approach—comprising data filtering/aggregation and advanced packet processing—enables the Aviz Service Node cluster to detect network degradation in under **5 seconds.**

2. **Seamless Integration & Enhanced Observability**
   Aviz's **Deep Network Observability** solution seamlessly integrates with diverse data sources. It leverages ASIC-specific hardware filtering capabilities via the Aviz Open Packet Broker application running on SONiC, while utilizing a standardized, scalable real-time data streaming format that aligns with customers' existing analytics tools.

3. **Cost Optimization at Every Stage**
   Aviz reduces costs by leveraging **white-box switches running SONiC** and standard servers with network processing offload via widely available **Data Plane Development Kit (DPDK)-capable NICs.** Multi-core CPUs enable DPDK to efficiently process high-bandwidth traffic. Customers also gain flexibility in hardware selection, as **DPDK is tested and qualified across various NICs and supports many CPU architectures,** ensuring compatibility with their environment.

4. **Software-Driven Flexibility & Savings**
   Aviz delivered a comprehensive software suite, giving customers full control over their network hardware choices. First, they could select their preferred network switch vendors or even repurpose existing switches. Second, Aviz introduced DPDK-based Service Nodes for SLA monitoring, KPI tracking deployable on co modity servers. This purely software-based approach maximized flexibility, allowed cost-efficient hardware selection, and delivered substantial savings.

The Business Outcome

Aviz reduces DPI **hardware footprint and power use by 80%** while maintaining high performance and low latency for a best-in-class mobile user experience (QoE).

By consolidating functions and standardizing data processing, it streamlines operations, cuts maintenance, and lowers troubleshooting efforts for greater efficiency and savings.

The solution scales seamlessly to support multi-hundred Gbps traffic, maintaining and enhancing data sampling rates **for real-time observability without performance degradation.**

Optimized filtering and DPDK acceleration **enable high-throughput processing** with minimal resource use.

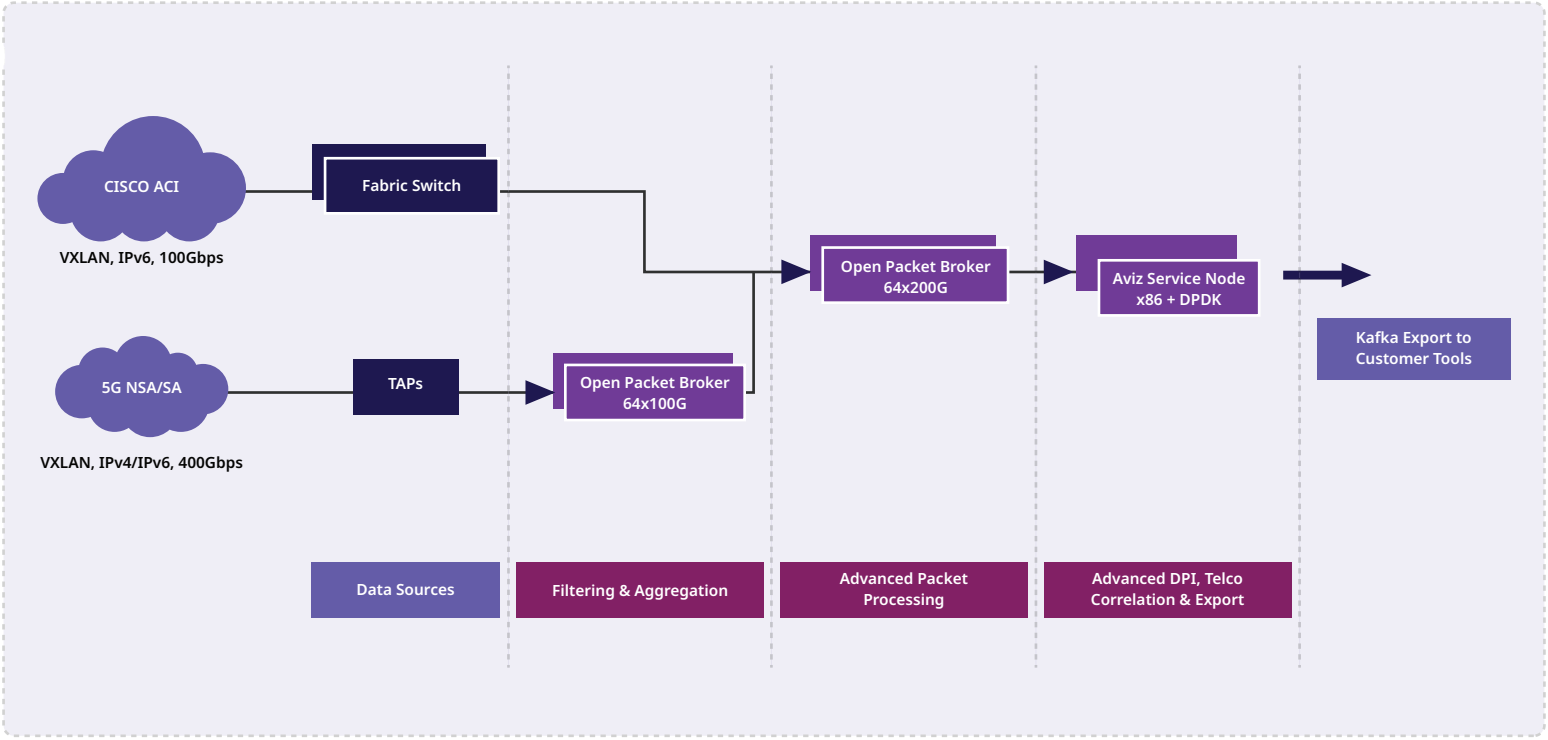
Seamless integration with existing infrastructure ensures interoperability, while real-time Kafka data streaming enables **easy adoption into current analytics and monitoring tools**

Aviz lowers development costs, extends hardware/ software lifecycles, and eliminates frequent upgrades, delivering a cost-effective, scalable, and future-proof solution.

> Collaborating with Aviz, we successfully implemented a scalable, high-performance network observability solution that seamlessly integrates with existing infrastructure. This deployment has significantly enhanced network observability, reduced operational complexity, and ensured long-term cost efficiency for our customers.

Keisuke Miura
Deputy General Manager
Itochu Techno-Solutions Corporation

Solution Architecture



Deployment Overview

The solution comprises the following key components:

Data Sources

- 5G NSA/SA: Captures VXLAN traffic (IPv4/IPv6) at 400Gbps, covering both Control Plane (C-Plane) and User Plane (U-Plane) data from vTAPs (Ericsson and Samsung) and BIDI TAPs.
- Cisco ACI Fabric: Handles telco control traffic encapsulated in VXLAN (IPv6) at 100Gbps.

Filtering & Aggregation

- Aviz Open Packet Broker NOS (OPBNOS) runs on white-box switches using Broadcom and NVIDIA ASICs, supporting 10-400Gbps to ensure only relevant traffic enters the processing pipeline.
- This optimizes performance by minimizing processing overhead while preserving critical data flow.

Advanced Packet Processing

Open Packet Broker leverages ASIC programmability for advanced functions, including:

- VXLAN header stripping, encapsulation, and decapsulation.
- Symmetric traffic load balancing of GTP-C and GTP-U based on inner headers.
- This ensures efficient processing of control and user-plane packets, enhancing performance and correlation.

Advanced DPI, Data Correlation & Export

1. Aviz Service Node (ASN), running on commodity x86 hardware, delivers high-performance packet processing using DPDK-optimized deep packet inspection and metadata extraction.
2. GTP Correlation: ASN correlates Control and User sessions across 4G-LTE, 5G-NSA, and 5G-Core (5G-C) networks.
3. KPI Computation
   - Latency and bandwidth utilization measured with 5-second granularity.
   - Real-time analytics for network monitoring and SLA enforcement.
4. Metadata Extraction:
   - KPI insights, IP information, GTP session details, and application payload analysis.
5. Kafka Export:
   - Processed data is streamed via Kafka to customer analytics tools for visualization, reporting, and anomaly detection.

Conclusion

The Deep Network Observability Deployment outlined in this whitepaper offers a high-performance, scalable, and intelligent solution for monitoring mobile user experience across 5G and Data Center networks. By integrating VXLAN filtering, Cisco ACI packet processing, GTP correlation, KPI computation, and Kafka-based data export, organizations can achieve deep network insights while ensuring efficiency and performance.

This solution is especially beneficial for telecom operators, cloud service providers, and enterprise data centers seeking to optimize network performance and enhance service assurance. Future enhancements may include AI-driven anomaly detection and predictive analytics to further strengthen network reliability and security.

Connect with Aviz Networks today and discover how our innovative solutions can drive your business forward.