# Fixed Broadband Quality of Service (QoS) Surveys

## Network End Surveys

Quarter-01 2024

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# 1. Background

The **Fixedline Quality of Service (QoS**) surveys for fixedline operators are conducted to assess the performance, reliability, and user satisfaction of fixed-line broadband services across Pakistan. This survey aims to understand how well service providers meet the regulatory benchmarks and consumer expectations for internet speed, connectivity stability, and customer support. As fixed-line broadband plays a crucial role in both personal and business communication, ensuring high-quality service, critical for the continued growth of digital infrastructure.

These Surveys across Pakistan are governed by the "Fixed Broadband Quality of Service Regulations, 2022." The regulations were enacted to set **Key Performance Indicators (KPIs)** that **Broadband Service Providers (BSPs)** must meet to ensure reliable and high-quality fixed broadband services across Pakistan. These KPIs serve as measurable benchmarks to assess the service quality delivered to customers, including aspects such as network uptime, data throughput, latency, jitter, packet loss, and customer service responsiveness.

# 2. Scope

QoS surveys are crucial tools for measuring the performance of broadband networks in Pakistan, ensuring service providers adhere to high standards, and continually improving the availability and quality of internet services for consumers. These surveys cover all fixed broadband technologies in use, such as xDSL, DSL, copper and fiber optics technologies. The regulations apply to all BSPs operating in Pakistan, requiring them to maintain **minimum service standards** at various levels of their networks from access nodes to core nodes.

These surveys also provide critical data on network performance, helping identify gaps and inefficiencies in service delivery. This helps regulatory authorities enforce service standards and ensure BSPs meet the requirements for customer satisfaction.

By regularly testing and publishing the results of broadband services, the PTA promotes **transparency**. BSPs are held accountable for their network performance, fostering competition and driving improvements in broadband services.

By gauging factors such as **download/upload speeds**, network latency, and customer service efficiency, the surveys enable BSPs to improve their networks, which directly impacts the **user experience**.

## 3. Methodology

The Quarter 01 started from January 1, 2024 till March 31, 2024. In the 1st Quarter surveys, **20 major BSPs** operating in **14 cities** across Pakistan were targeted. These cities were selected based on their high subscriber density, ensuring that the surveys focused on areas where the quality of service would have the most significant impact. The surveyed cities include:

i. Lahore
ii. Peshawar
iii. Rawalpindi
iv. Karachi
v. Quetta
vi. Abbottabad
vii. Multan
viii. Sukkur,
ix. Hyderabad
x. Muzaffarabad
xi. Haripur
xii. Mirpur
xiii. Gwadar
xiv. Faisalabad

The surveys are conducted by the teams of **Enforcement Division, PTA** at the **Network Operation Centers (NOCs)** of each BSP. This method allowed for real-time assessments of network performance across various parameters, offering a detailed insight into the performance of fixed broadband networks at a deeper, technical level.

## 4. Parameters Monitored and Survey Results

Following key network performance parameters are checked during the surveys:

i. Bandwidth Utilization
ii. Network Availability
    a) Core Nodes
    b) Access Nodes

iii. Network Latency / Round Trip Time (RTT)

a) Local Network Latency

b) International Segment – Terrestrial

iv. Jitter

Below mentioned are details of Network level parameters measurement details along with survey results:

## i. Bandwidth Utilization

This measures how effectively the network's capacity is being used. It is the ratio of peak utilization of bandwidth to the total bandwidth available.

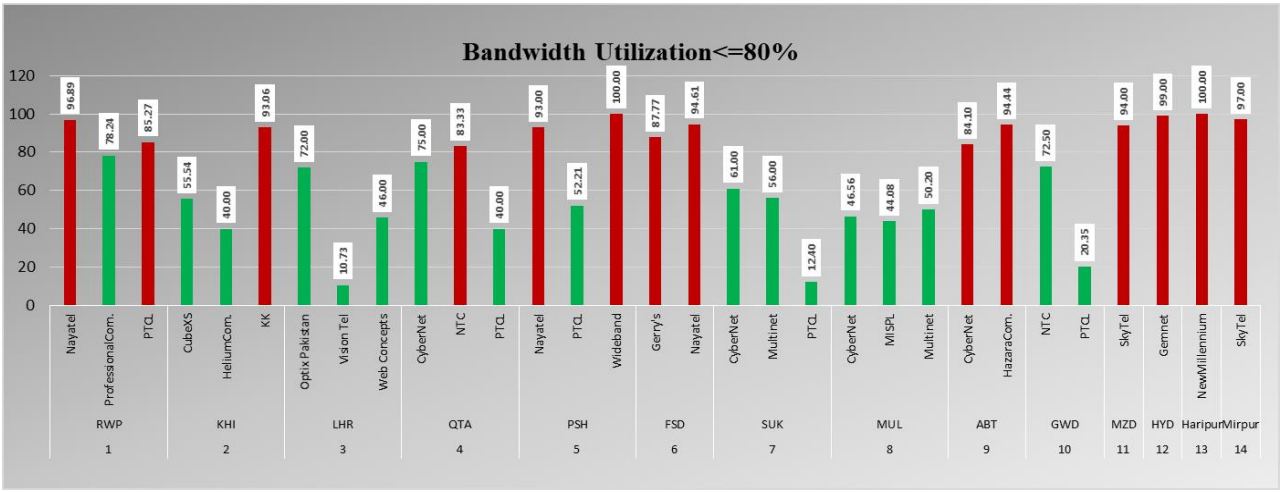
**Benchmark:**

The bandwidth utilization should be < **80%**

**Measurement**

BSPs are required to run "Daily" MRTG (Multi Router Traffic Grapher) Graphs at 5 minute average during peak hours. The highest bandwidth utilization is the peak utilization level for each month. BASPs are required to run "Monthly" MRTG Graphs to obtain average bandwidth utilization for each month for their network. BSPs should closely monitor their links and the loading level shall not exceed.

**Bandwidth Utilization** = (Peak Utilization level of the network / Total bandwidth available) x 100%



**Results**

KPI Bandwidth utilization is not complied for majority of the operators and exceeds above 80%. Operators that did not comply includes PTCL (Rawalpindi), NayaTel (Rawalpindi, Peshawar, Faisalabad), CyberNet (Abbottabad), NTC (Quetta), Gemnet (Hyderabad), KK Network (Karachi), Gerry's (Faisalabad), Hazara Communication ( Abbottabad), New Millennium (Haripur), Sky Tel (Mirpur & Muzaffarabad) and Wideband (Peshawar).

## ii. Network Availability

Network Availability is the measure of the degree to which the network (Access and Core) is operable and not in a state of failure or outage at any point of time.

It measures the total downtime of the network, including the ATM/IP switches, multiplexers, routers, e-mail facilities (if provided) and connection to Internet backbone over a month. All scheduled downtime for the purposes of maintenance and upgrading of the network system will be excluded from the calculation.

**Benchmark**

Network Availability for:

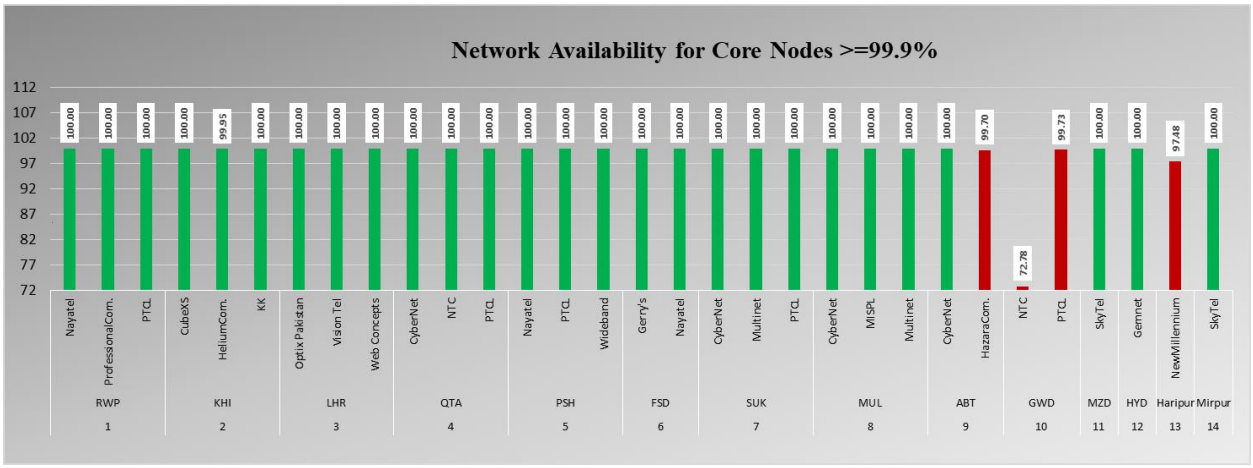
a) Access Nodes should be > 99% and for;
b) Core Nodes should be > 99.9%

**Measurement**

**Network Availability** = (Total operational minutes - Total minutes of service downtime) / (Total operational minutes) x 100%

### a) Network Availability – Core Nodes

Core Nodes include BRAS, Metro Ethernet Switches, routers etc. along with their Operational Minutes and Down Time Minutes.

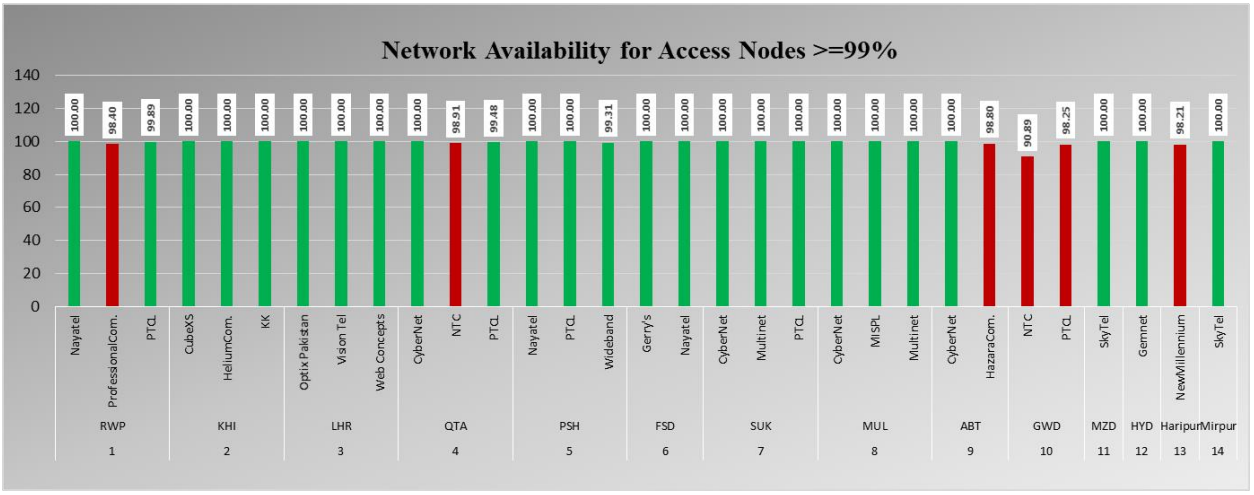



**Results**

Majority of operators comply with KPI i.e. Network Availability of Core Node. Only NTC and PTCL in Gwadar, Hazara Communication in Abbottabad and New Millennium in Haripur are exceeding their KPI threshold.

## b) Network Availability – Access Nodes

Access Nodes include MSAGs/MSANs, DSLAMs, ONUs, etc. along with their Operational Minutes and Down Time Minutes.




**Results**

Majority of operators comply with KPI i.e. Network Availability of Access Node. However, Professional Communication (Rawalpindi), NTC (Gwadar, Quetta), PTCL (Gwadar), Hazara Communication (Abbottabad) and New Millennium (Haripur) are exceeding their KPI threshold.

## iii. Network Latency / Round Trip Time (RTT)

Latency or Round Trip Time (RTT) is the measure of duration of round trip for a data packet between specific source and destination. It is used to measure the delay on a network at a given time. The greater the latency within a network, the longer it takes packets to reach their destination.

**Benchmark**

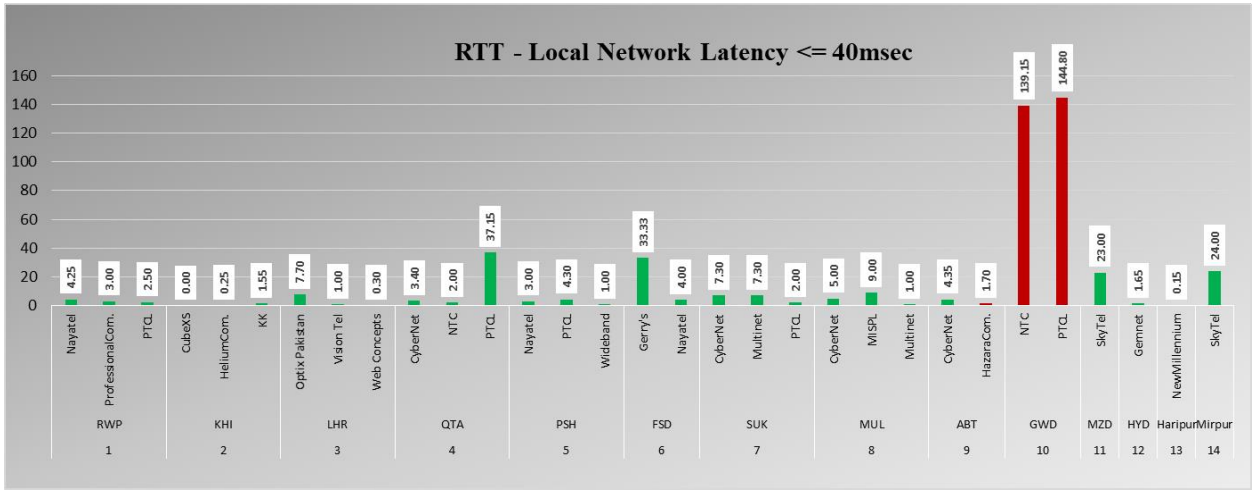
| Network Latency in Segment | Threshold |
|---|---|
| Local Network Latency | = 40 msec |
| International segment - Terrestrial | = 110 msec |

**Measurement**

The RTT test shall be conducted using **"ping"**' based on a minimum standard packet size of 32 bytes, and should be measured up to the edge node of the network, connected to the Internet cloud or any other server decided by the Authority. .

## a) Round Trip Time (RTT) – Local Network

For calculating the Local Network Latency, obtain IP address of BSP's BRAS and run command "ping xxxx.xxxx.xxxx.xxxx –n 100" in DOS Prompt / mode. (xxxx here refers the IP address of the BRAS).

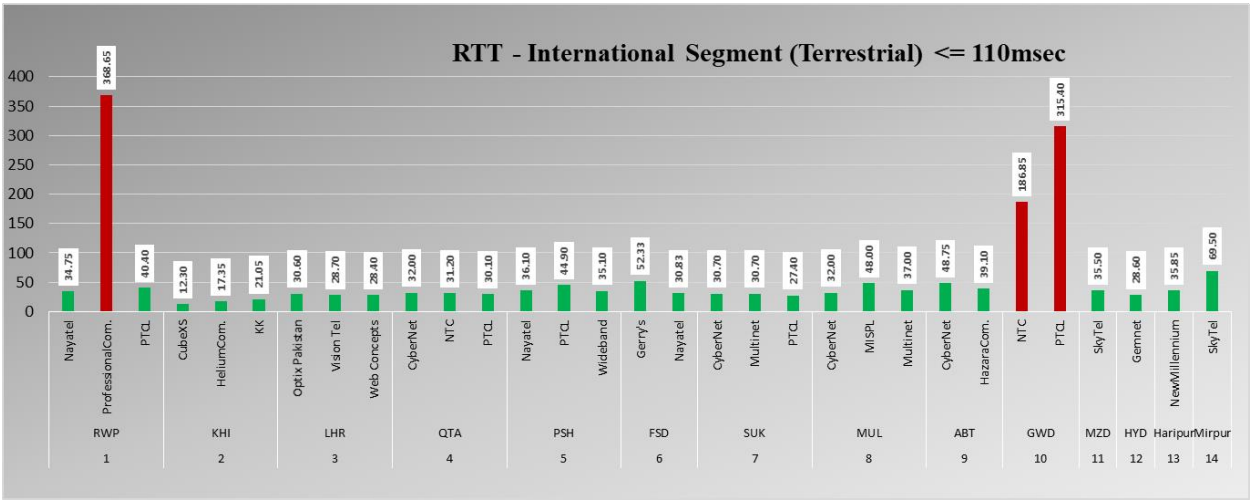


**Results**

Majority of operators comply with KPI i.e. Round Trip Time for Local Network. Only NTC and PTCL in Gwadar, are exceeding their KPI threshold value.

## b) Round Trip Time (RTT) – International segment (Terrestrial)

For Calculating the International Segment – Terrestrial Segment: Run the following command " ping www.google.com –n 100" or any international known server as decided by the PTA team.




**Results**

Majority of operators comply with KPI i.e. Round Trip Time for International Segment (Terrestrial Network). Only NTC and PTCL in Gwadar and Professional Communication in Rawalpindi, are exceeding their KPI threshold value.

## iv. Jitter (mses)

A jitter is a variation in latency. High amounts of jitter cause packets to be delivered out of sequence. In a specific time window, jitter refers to the variation between the maximum delay and minimum delay.

**Benchmark**

The Jitter should be **< 15 msec**

**Measurement**

The Jitter shall be calculated using **'ping'**. The minimum samples shall be 100. If RTT avg is the average RTT, derived out of 100 samples, and RTT 1, RTT 2....RTT 100 are the RTT for individual packets then jitter shall be calculated as follows:

Jitter (msec) = X (RTTavg-RTTk)/100 (magnitude shall be used without *+/-' signs)


**Results**

Majority of operators comply with KPI i.e. Jitter. Only Bliss Communication and NTC for Faisalabad, are exceeding their KPI threshold value.

## 5. Quarterly Standing of BSPs for Quarter-01 2024

| City | Company Name | Network Availability Core Nodes >=99.9% | | Network Availability - Access Nodes >=99% | | RTT - Local Network Latency <= 40msec | | RTT - International Segment – Terrestrial <= 110msec | | Bandwidth Utilization< =80% | | Jitter<=15 msec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Obtained % | Compliance (Y/N) | Obtained % | Compliance (Y/N) | Obtained % | Compliance (Y/N) | Obtained % | Compliance (Y/N) | Obtained % | Compliance (Y/N) | Obtained % | Compliance (Y/N) |
| Rawalpindi | PTCL | 100.00 | Y | 99.89 | Y | 3 | Y | 40.4 | Y | **85.27** | **N** | 3 | Y |
| Rawalpindi | Nayatel | 100.00 | Y | 100.00 | Y | 4 | Y | 34.75 | Y | **96.89** | **N** | 3 | Y |
| Rawalpindi | ProfessionalCom. | 100.00 | Y | **98.40** | **N** | 3 | Y | **368.65** | **N** | 78.24 | Y | 5 | Y |
| Karachi | KK | 100.00 | Y | 100.00 | Y | 1.55 | Y | 21.05 | Y | **93.06** | **N** | 1.06 | Y |
| Karachi | CubeXS | 100.00 | Y | 100.00 | Y | 0.00 | Y | 12.30 | Y | 55.54 | Y | 0.28 | Y |
| Karachi | HeliumCom. | 99.95 | Y | 100.00 | Y | 0.25 | Y | 17.35 | Y | 40.00 | Y | 1.78 | Y |
| Lahore | Optix Pakistan | 100.00 | Y | 100.00 | Y | 7.7 | Y | 30.6 | Y | 72.00 | Y | 0.74 | Y |
| Lahore | Web Concepts | 100.00 | Y | 100.00 | Y | 0.3 | Y | 28.4 | Y | 46.00 | Y | 0.44 | Y |
| Lahore | Vision Tel | 100.00 | Y | 100.00 | Y | 1 | Y | 28.7 | Y | 10.73 | Y | 2.04 | Y |
| Quetta | PTCL | 100.00 | Y | 99.48 | Y | 37.15 | Y | 30.1 | Y | 40.00 | Y | 1 | Y |
| Quetta | CyberNet | 100.00 | Y | 100.00 | Y | 3.40 | Y | 32 | Y | 75.00 | Y | 0.77 | Y |
| Quetta | NTC | 100.00 | Y | **98.91** | **N** | 2.00 | Y | 31.2 | Y | **83.33** | **N** | 0.41 | Y |
| Peshawar | PTCL | 100.00 | Y | 100.00 | Y | 4 | Y | 44.9 | Y | 52.21 | Y | 7.0 | Y |
| Peshawar | Nayatel | 100.00 | Y | 100.00 | Y | 3 | Y | 36.1 | Y | **93.00** | **N** | 1.00 | Y |
| Peshawar | Wideband | 100.00 | Y | 99.31 | Y | 1 | Y | 35.1 | Y | **100.00** | **N** | 1.00 | Y |
| Faisalabad | Nayatel | 100.00 | Y | 100.00 | Y | 4 | Y | 30.83 | Y | **94.61** | **N** | 0 | Y |
| Faisalbad | Gerry's | 100.00 | Y | 100.00 | Y | 33.33 | Y | 52.33 | Y | **87.77** | **N** | **37.25** | **N** |
| Sukkur | PTCL | 100.00 | Y | 100.00 | Y | 2.00 | Y | 27.40 | Y | 12.40 | Y | 0.72 | Y |
| Sukkur | CyberNet | 100.00 | Y | 100.00 | Y | 7.30 | Y | 30.70 | Y | 61.00 | Y | 1.93 | Y |
| Sukkur | Multinet | 100.00 | Y | 100.00 | Y | 7.30 | Y | 30.70 | Y | 56.00 | Y | 0.88 | Y |
| Multan | CyberNet | 100.00 | Y | 100.00 | Y | 5 | Y | 32 | Y | 46.56 | Y | 1.24 | Y |
| Multan | Multinet | 100.00 | Y | 100.00 | Y | 1 | Y | 37 | Y | 50.20 | Y | 2 | Y |
| Multan | MISPL | 100.00 | Y | 100.00 | Y | 9 | Y | 48 | Y | 44.08 | Y | 14 | Y |
| Abbottabad | CyberNet | 100.00 | Y | 100.00 | Y | 4.35 | Y | 48.75 | Y | **84.10** | **N** | 1.91 | Y |
| Abbottabad | HazaraCom. | **99.70** | **N** | **98.80** | **N** | 1.70 | Y | 39.1 | Y | **94.44** | **N** | 0.68 | Y |
| Gawadar | PTCL | **99.73** | **N** | **98.25** | **N** | **145** | **N** | **315** | **N** | 20.35 | Y | **321** | **N** |
| Gawadar | NTC | **72.78** | **N** | **90.89** | **N** | **139** | **N** | **187** | **N** | 72.50 | Y | **125** | **N** |
| Muzaffarabad | SkyTel | 100.00 | Y | 100.00 | Y | 23 | Y | 35.5 | Y | **94.00** | **N** | **52** | **N** |
| Hyderabad | Gemnet | 100.00 | Y | **60.00** | **N** | 1.65 | Y | 28.60 | Y | **99.00** | **N** | 0.57 | Y |
| Haripur | NewMillennium | **97.48** | **N** | **98.21** | **N** | 0.15 | Y | 35.85 | Y | **100.00** | **N** | 0.52 | Y |
| Mirpur | SkyTel | 100.00 | Y | 100.00 | Y | 24 | Y | 69.5 | Y | **97.00** | **N** | **260** | **N** |

## 6. KPIs Analysis

- **Bandwidth utilization,** Network is choked with high bandwidth utilization for most of operators including PTCL, Nayatel, CyberNet, Gemnet Enterprise, KK Network, Wideband, NTC, Gerry, Skytel, Hazara Communication, and New Millennium.
- **Latency** for International segment is very high for Professional Communication (pvt.) Ltd and not meeting PTA targets.
- **Jitter** is high for Gerry's (Faisalabad) and Sky Telecommunication (Pvt.) Ltd. for AJ&K.
- **Network Availability for Access/Core Nodes** is below the threshold for PTCL (Gwadar), NTC (Gwadar, Quetta), Helium Communication (Karachi), Hazara Communication (Abbottabad) and New Millennium (Haripur).
- **For Gawadar city,** PTCL and NTC are not meeting PTA targets for Network end KPIs including (i) Network Availability (For Core and Access Nodes), (ii) Latency (For local and International Segment) and (iii) Jitter.

## 7. Conclusion

Survey results revealed that majority of surveyed BSPs have not complied with one of the major KPI i.e. **Bandwidth utilization**. High bandwidth utilization leads to low Download / Upload speeds during peak traffic hours, impacting user experience and quality of service.

Non-compliant BSPs were notified, and they were provided with their performance metrics to address the identified issues.