

Connectivity Performance measurement for rural regions. Technical and Social Challenges in Advancing Internet Equity

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- Internet Grades of Service in Rural Areas

What are we doing it?

- We are examining the existing measuring internet/connectivity performance tools available such as RIPE Atlas and M-Lab, or proprietary platforms like nPerf and Ookla. There are also state-owned initiatives like MySpeed in India, or community-owned and operated initiatives like ISOC's MIRA pods and region-specific efforts such as AIORI that we are examining.
- We are working to **understand, measure, and improve internet performance** in rural areas—particularly in regions served by **small and community-based internet operators**. Our goal is to develop and support **user-centric, locally appropriate internet performance measurement systems** that reflect the **real experiences of rural users** and empower operators to deliver high-quality, reliable connectivity.
- We are developing the **Recommendation Practice Metrics** for Connectivity Performance Framework measuring the efficiency, effectiveness and reliability of connectivity to the end users in the last mile. This metrics helps small operators and/or village-level internet service providers (ISP) and last mile users to understand threshold demand and supply of internet connectivity.

Some of the questions that we are trying to answer through this framework

- **What standard or performance metrics** should be applied to measure the performance of internet connectivity, especially in rural areas?
- Does performance measurement in such rural areas differ from urban-centric locations?
- Whose measurements matter?
- Does it need to be region-specifics?
- What are the minimum metrics parameters that are important for small-operators or village-level operators for providing quality of services?
- Measure the metrics along with other services provided by small operators
- How this metrics will help small operators or village-level operators to maintain the quality of services

Why are we doing it?

- 2.6 billion people unconnected, majority of them are from Global South including 958.8 million from Southern Asia; 362 million from Eastern Africa and 265 million from Western Africa*
- In many rural regions, users experience slow speeds, frequent disconnections, high latency, and poor service reliability. However, these problems often go unreported or unmeasured because the existing monitoring tools are either not deployed, not localized, or not accessible to users or small operators.
- In rural areas—often served by small, local, or community-based internet operators—while existing measurements tools have the following gap
 - Measurement tools like Ookla, M-Lab, RIPE Atlas, SamKnows are heavily concentrated in urban or well-connected areas.
 - Tools often measure generalized metrics like speed, latency, and jitter, but don't account for contextual user experiences
 - Many tools require dedicated hardware probes (e.g., RIPE Atlas anchors), high-end devices, stable power and connectivity which is not feasible for small ISPs or network operators
- * Source: Statista (<https://www.statista.com/statistics/1378504/people-do-not-use-internet-by-region/>)

Why does it matters for small operators?

Definition of small operators: **Wireless Internet Service Providers, Community networks and local ISPs (which are limited to specific geography, community/villages or region)**

- Internet performance measurement is not a luxury, but a **strategic and operational necessity to serve their communities/region**
- Demonstrating Quality of Service (QoS): **Connectivity Measurement Metrics** data helps small operators prove that they are delivering reliable and competitive service, which is essential for building trust with both users and regulators.
- **Troubleshooting and Network Planning: Connectivity Performance Measurement** tools allow operators to detect congestion, diagnose service issues, and optimize their networks. This is especially important in rural environments where technical teams are small and reactive solutions are costly.
- **Accountability and Transparency:** With rising expectations around service quality, performance data helps small operators engage transparently with customers and pre-empt dissatisfaction, which can affect retention and reputation.
- **Shaping Inclusive Regulation:** Without data, small operators are often excluded from policy conversations. Internet performance metrics from rural networks can push for **context-aware regulations** that reflect the realities of last-mile connectivity.

Approach

We are working to develop a Connectivity Performance Metrics that are:

- **Context-sensitive** to rural realities
- **Technically feasible** for small and community-based internet service providers (ISPs)
- **User-centric**, capturing the lived experiences of rural internet users
- **Actionable**, to inform improvements in connectivity, policy, and investment

Specifically, we are:

1. Identifying the Gaps

- Mapping where and why rural internet performance is not being measured accurately
- Highlighting the technical and social barriers that prevent small operators from participating in national or global measurement frameworks

2. Developing or Supporting Localized Measurement Tools

- Co-creating low-cost, easy-to-deploy tools tailored for small ISPs and rural users
- Supporting community-driven measurement models that reflect actual usage patterns and local priorities

3. Creating Inclusive Metrics and Benchmarks

- Working to shift how “good internet” is defined by ensuring that rural voices and challenges shape performance standards and digital inclusion indicators

Different measuring tools and their parameters

M-Lab Internet Measurement tool	Network Diagnostic tool – Download speed, upload speed, Round-Trip Time (RTT), Packet Retransmission Rate, Congestion Window (CWND), Buffer Delay, Time to First Byte (TTFB), Network Congestion Indicators
Ripe Atlas	NDT7 (Newer version of NDT) - Client & Server Location, TCP Info Metrics, Browser/Device Metadata Ping: Round-Trip Time (RTT), Packet Loss, Jitter, Traceroute: Hop Count, Per-Hop Latency, Routing Path DNS (Domain Name System) Resolution: Query Response Time, DNS Resolver Reachability
ISOC's Internet Resilience Index	Infrastructure: exit points per capita; Fibre network reach, number of IXPs, data centers per capita Performance: Median download and upload speeds, Latency (average network delay) Security & Tech: IPv6, HTTPS, DNSSEC, MANRS, secure servers, cybersecurity
	Market Readiness: Market concentration (HHI), peering efficiency, domain counts, local content, affordability

What are we looking for?

- We are looking for case-studies who would like to participate in this Measurement Framework
- Provide support in using this framework for their networks