IPv6 Network Deployment Monitoring and Analysis

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v6ops, IETF 124

Updates before IETF124

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- **In Section 3:** we proposed an <u>IPv6 End-to-End Monitoring and Analysis System Architecture.</u>

- **In Section 4:** we added Scenario-Based Capability Examples.

- **In Section 6:** we added Implementation Considerations.

Background

What Information is Lacking During IPv6 Deployment?

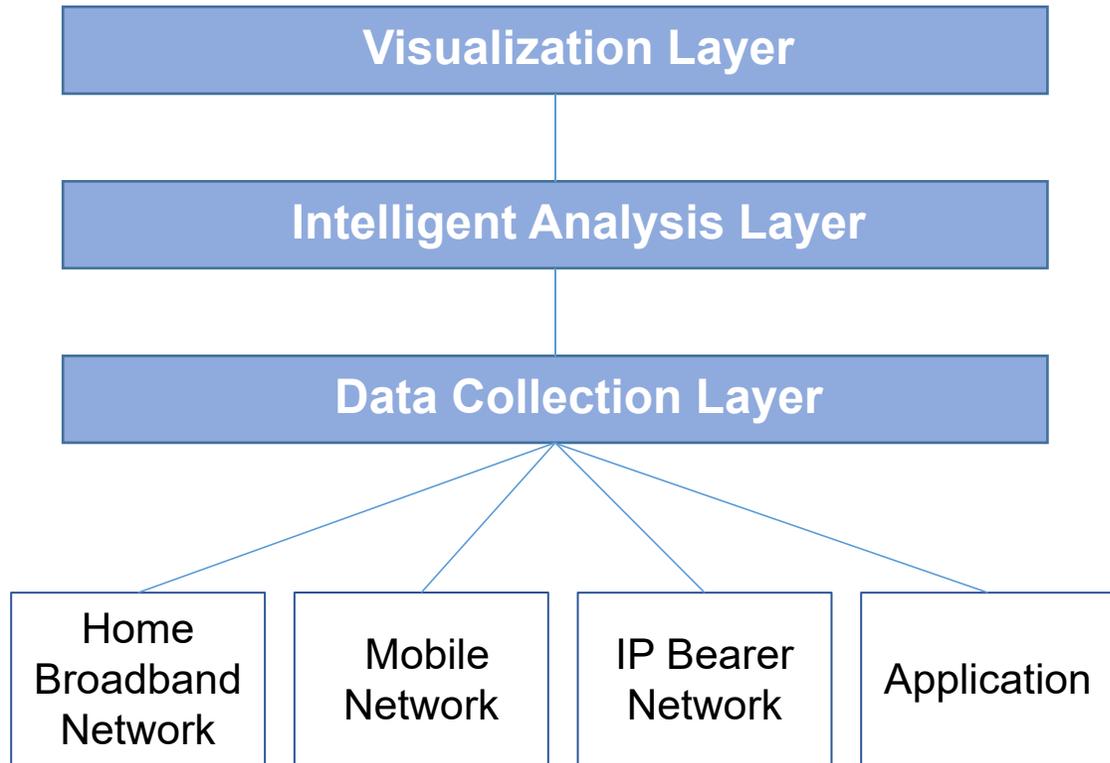|	
Fragmented Monitoring Coverage	Monitoring points are mostly focused on backbone networks, and they don't have detailed visibility into user terminals, access networks, or application endpoints.
Single-Dimensional Evaluation	Assessments mainly depend on basic metrics like IPv6 traffic rates, with no full view of transmission quality, network element readiness, or active connection states.
Lack of Cross-Domain Correlation	Data silos exist between different network domains, preventing end-to-end path analysis and fault correlation.
Insufficient In-Depth Analysis	Incomplete IPv6 transformation in private apps and content delivery chains is still hard to detect, because we lack deep monitoring for these cases.
Limited Dynamic Prediction	Current models can't easily measure how external factors (e.g., policy changes, user behavior, market dynamics) affect IPv6 evolution, which holds back proactive planning.

IPv6 End-to-End Monitoring and Analysis Architecture

Visualization Layer

Intelligent Analysis Layer

Data Collection Layer

Home Broadband Network

Mobile Network

IP Bearer Network

Application

Data Collection Layer

- Establishes unified interface standards to integrate multi-source data from home broadband network, mobile network, IP bearer network and application side.

- For data collection, it can access the **existing network management systems** of various professional networks.

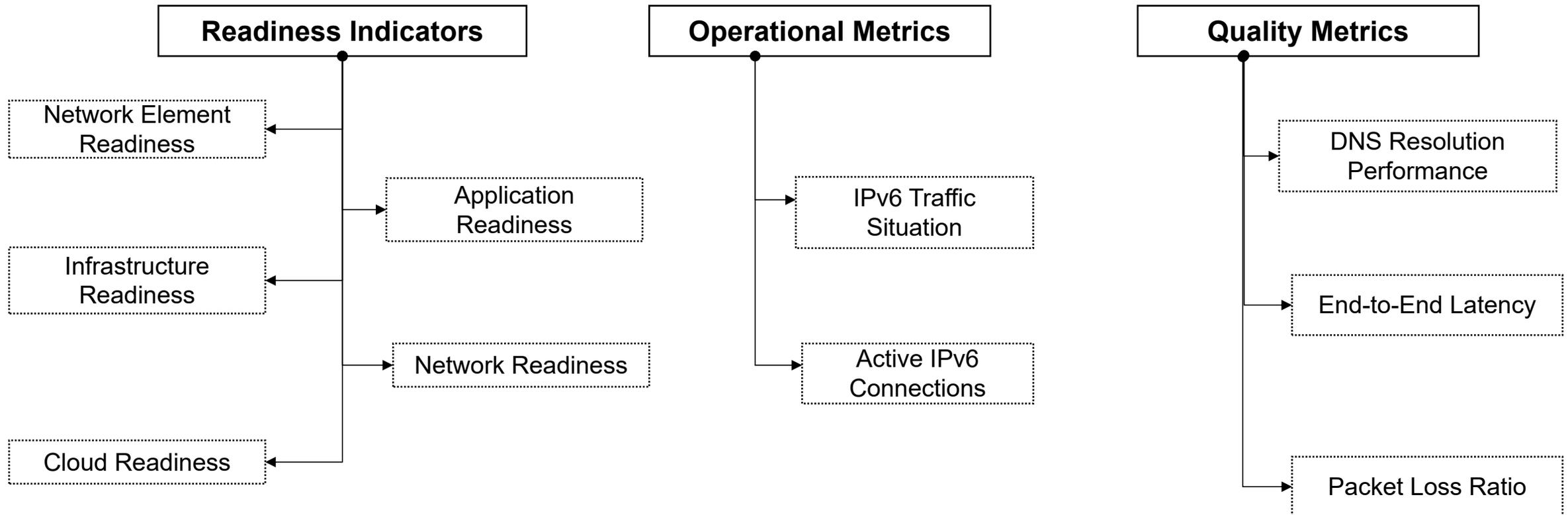(daily-level and large-volume data)

Intelligent Analysis Layer

- Dynamic Traffic Attribution: Low IPv6 deployment rate regions are identified, and we develop a correlation analysis plan to identify which specific subsystem (or two) the problem comes from.

- User-level Topology Reconstruction: Maps service chains, rebuilds end-to-end topologies, and supports segmented **latency/packet loss diagnosis**.

Visualization Layer

- Provides indicator-based presentation and decision support.

Key Performance Indicators

Most of current systems are local-index analyses. In order to more comprehensively show the IPv6 deployment status and analyze the **bottlenecks** and **blocking points** of IPv6 deployment, we have newly defined a complete set of key performance indicators.
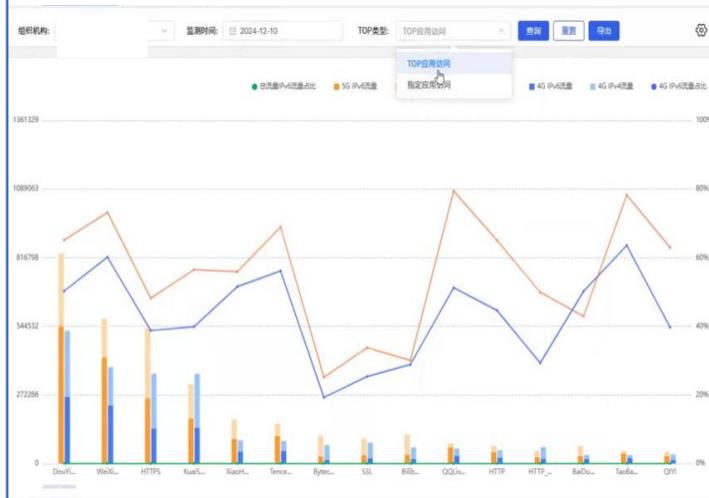
Readiness Indicators	Operational Metrics	Quality Metrics
Network Element Readiness	IPv6 Traffic Situation	DNS Resolution Performance
Application Readiness	Active IPv6 Connections	End-to-End Latency
Infrastructure Readiness		Packet Loss Ratio
Network Readiness		
Cloud Readiness		

It can better demonstrate the IPv6 deployment status of a region.

Examples of Our System's Scenario-Based Capabilities

①IPv6 Monitoring and Analysis on the User Side

- The IPv6 support rate in the user access traffic of TOP applications.
- Comparison of IPv6 Traffic Between Mobile Users and Home Users..
- others....

②IPv6 Support and Application Access Quality Monitoring for Websites and Applications

- Monitoring the IPv6 support status and quality of the secondary and tertiary links of websites or applications.
- and so on...

③Demonstrate and score the IPv6 deployment status of a region based on the indicator system.
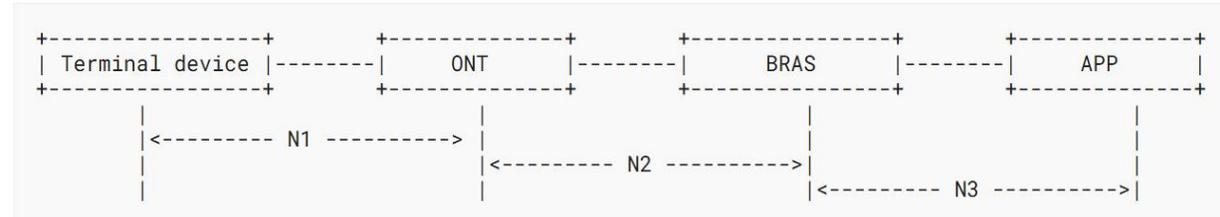
Use Case: User Network Quality Issue Localization

Scenario: User A experiences lag during home cloud gaming (disrupting gameplay) and needs root-cause technical investigation. Typically, the issue would be expected to occur at N2. However, after conducting a thorough inspection, it turns out that N2 is functioning properly.

Solution: To address the challenge, the system **reconstructed the complete end-to-end flow from the user's terminal to the cloud gaming application** (shown in the figure), analyzed performance metrics across three network segments N1, N2 and N3. After analysing, the system identified abnormal **N1 segment** latency as the direct cause of the lag.

Conclusion: Expert analysis shows poor home IPv6 network quality comes from three issues: bad router placement, signal interference, and inadequate device maintenance.

Next Step and Discussion

Our objective is to align with BCP.

What will be the focus of our subsequent improvement?

- ✓ The more use cases that the system can support
- ✓ The demonstration of our system at the IETF 125 Hackathon
- ✓ etc.

If you are interested in the draft or have suggestions on how we can enhance our draft

Please reach out to us!

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Thank you!