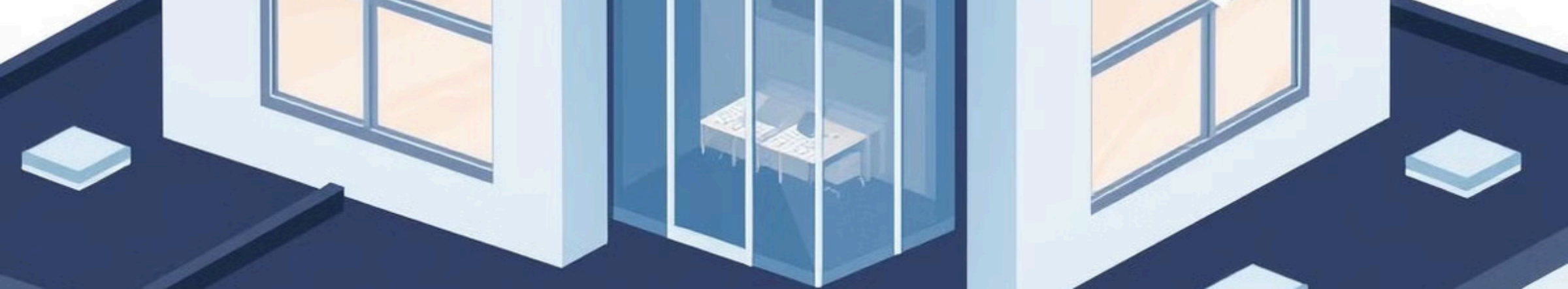# WiFi Performance Analysis: Monitoring, Recording, and Reporting

This presentation provides a detailed analysis of WiFi performance, focusing on the importance of monitoring, recording, and reporting key network parameters. We will explore various tools, techniques, and visualization methods to optimize network connectivity and ensure a better user experience. By understanding and addressing the factors that impact WiFi performance, network engineers and IT professionals can proactively identify and resolve network issues, enhancing overall network efficiency.

**S** **by Shubha268**

# Introduction to WiFi Performance Analysis

WiFi performance analysis is essential for identifying and resolving network issues, ultimately optimizing connectivity for users. This analysis involves monitoring key parameters such as speed, latency, and signal strength to ensure optimal network function. Effective monitoring and reporting are enabled through tools and visualization techniques. Understanding the interplay between these elements is crucial for maintaining a robust and efficient wireless network. This presentation will delve into each aspect to provide a comprehensive overview of WiFi performance analysis.

### Identify Network Issues

Pinpoint problems affecting WiFi performance.

### Optimize Connectivity

Improve WiFi speed and reliability.

### Efficient Monitoring

Use tools for real-time network analysis.

# Key Performance Parameters

Several key performance parameters are crucial in evaluating WiFi performance. These include download and upload speeds, latency (ping time), packet loss, and signal strength (RSSI). Monitoring network congestion, interference levels, and video streaming performance also offers valuable insights into overall network health. These metrics help diagnose specific issues and guide optimization efforts. Accurate and consistent data collection is essential for effective analysis.

Download Speed

Upload Speed

Network Congestion

# Download & Upload Speed Analysis

Download and upload speeds are fundamental indicators of WiFi performance. These speeds are influenced by factors such as signal strength, network congestion, and distance from the router. Packet loss can also significantly impact speed. Analyzing data from speed test tools and router statistics helps identify patterns like speed variations based on location or time. Visualizing this data using line charts and heatmaps provides a clear understanding of performance trends.

## Affected By

- Signal Strength

- Network Congestion

- Distance from Router

- Packet Loss

## Data Collection Sources

- Speedtest CLI

- Fast.com API

- Wi-Fi Router Statistics

Made with Gamma

# Latency & Packet Loss Analysis

Latency, or ping time, measures the responsiveness of the network, while packet loss indicates data transmission reliability. Latency is affected by network congestion, routing paths, and signal interference, while packet loss is influenced by interference, faulty hardware, and distance from the router. Tools like Ping and MTR help collect data. Patterns, such as spikes during congestion and correlations between speed loss and latency, are key indicators. Time series and scatter plots provide effective visualizations.

**1** Network Congestion

**2** Routing Path

**3** Signal Interference

# Signal Strength & Interference

Signal strength and interference significantly affect WiFi performance. Signal strength is impacted by router placement, physical barriers, and network congestion, while interference is caused by other electronic devices. Data is collected via router SNMP data and Wi-Fi analyzer tools. Lower signal strength with distance and fluctuations due to interference are common patterns. Heatmaps and line graphs are effective visualizations for illustrating these patterns.

Router Placement

1

2    Physical Barriers

3    Network Congestion
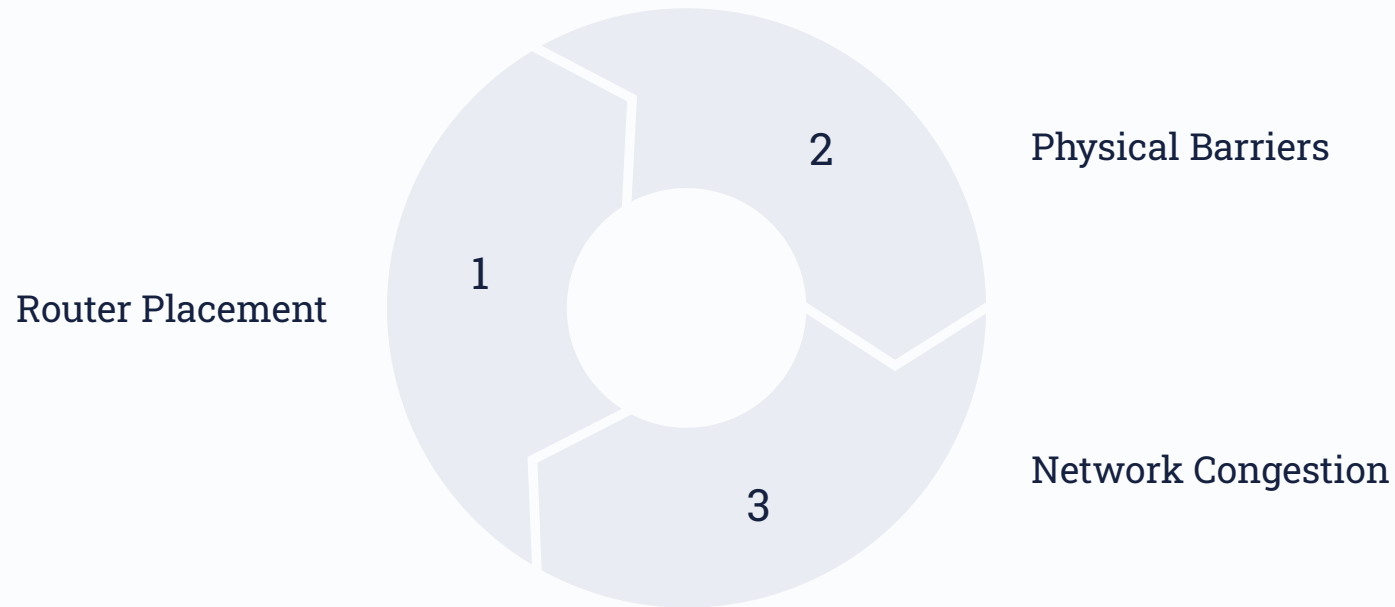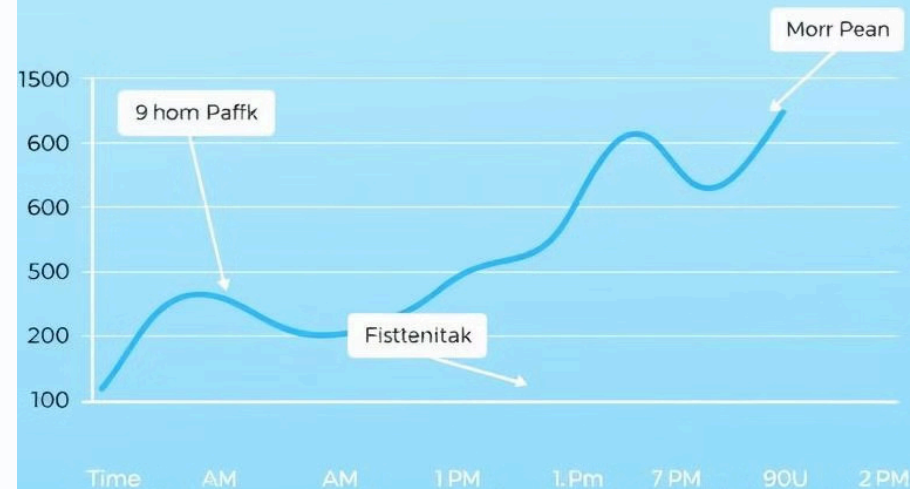
# Network Congestion

Network congestion occurs when high traffic, low bandwidth, or a large number of users overload the network, diminishing WiFi performance. Monitoring network congestion involves collecting data from Wi-Fi router logs and SNMP monitoring tools. Patterns include peak times during work hours and fluctuating performance. Heatmaps and line charts are effective for visualizing network congestion, highlighting peak usage times and overall traffic trends. Analyzing these visualizations enables proactive network management.

| High Traffic | Low Bandwidth |
|---|---|

| Many Users |
|---|

# Video Streaming & Browsing Performance

Video streaming and browsing performance depend on network congestion, latency, and packet loss, as well as DNS resolution and server response time. Data can be collected using tools like the Fast.com API, YouTube Data API, and WebPageTest. Common patterns include buffering issues and longer load times during high latency. Line charts and histograms are useful for visualizing these patterns, illustrating the impact of network issues on user experience.

1 Server Response Time

2 DNS Resolution

3 Latency

4 Packet Loss

5 Network Congestion
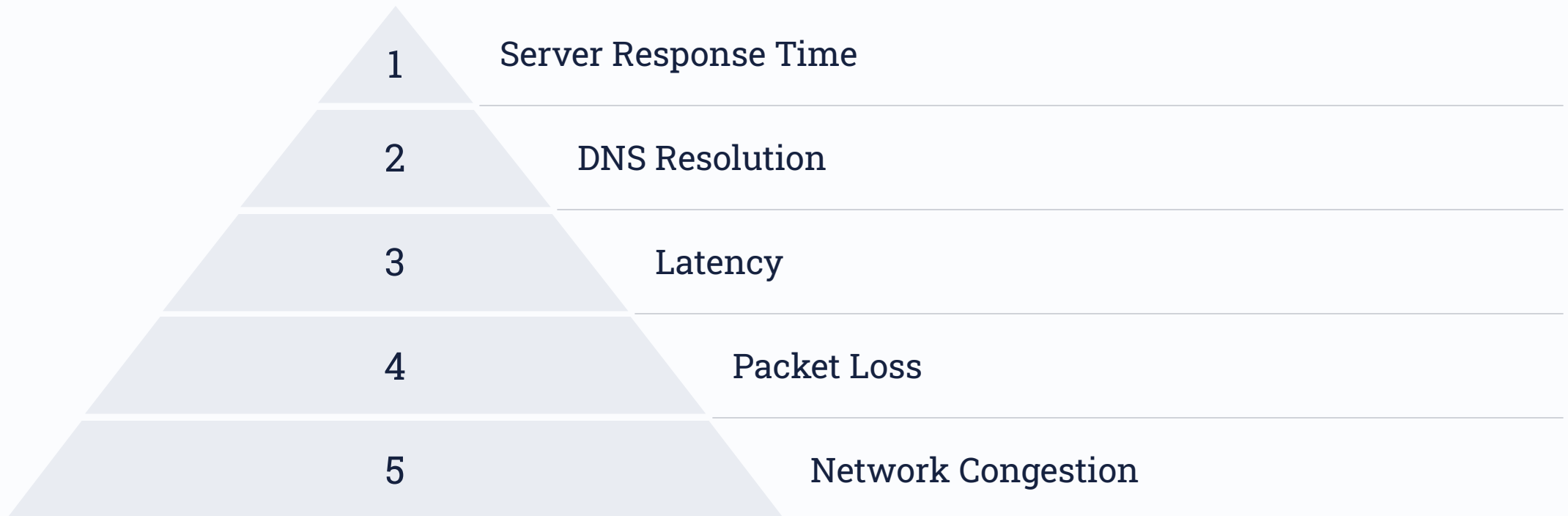
# Tools & Libraries for WiFi Performance Analysis

Various tools and libraries facilitate WiFi performance analysis. For speed testing, speedtest-cli and the fast.com API are useful. Latency and packet loss can be measured using Ping and MTR. Wi-Fi Analyzer and pysnmp help in assessing signal strength and interference. SNMP monitoring tools are valuable for network congestion analysis, while Lighthouse and WebPageTest aid in evaluating web performance. These tools provide comprehensive data for informed decision-making and network optimization.

| | |
|---|---|
| Speed Testing | speedtest-cli, fast.com API |
| Latency & Packet Loss | Ping, MTR |
| Signal Strength & Interference | Wi-Fi Analyzer, pysnmp |

# Conclusion: Optimizing WiFi Performance

Monitoring WiFi performance is vital for maintaining network efficiency and ensuring a seamless user experience. By leveraging data visualization and analysis tools, network issues can be promptly identified and resolved. Regular assessment and optimization ensure that the network operates at its best, providing improved connectivity and a better user experience. Consistent monitoring and proactive management are key to sustaining optimal WiFi performance.

Regular Assessment

Data Visualization

Proactive Management