NETWORK MEASUREMENT

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- Network performance is defined by the overall quality of service provided by a network. This encompasses numerous parameters and measurements that must be analysed collectively to assess a given network.

- Network performance measurement is therefore defined as the overall set of processes and tools that can be used to quantitatively and qualitatively assess network performance and provide actionable data to remediate any network performance issues.

WHY MEASURE NETWORK PERFORMANCE

- The demands on networks are increasing every day, and the need for proper network performance measurement is more important than ever before.
- Effective network performance translates into improved user satisfaction, whether that be internal employee efficiencies, or customer-facing network components such as an e-commerce website, making the business rationale for performance testing and monitoring self-evident.
- When delivering services and applications to users, bandwidth issues, network down time, and bottlenecks can quickly escalate into IT crisis mode. Proactive network performance management solutions that detect and diagnose performance issues are the best way to guarantee ongoing user satisfaction.

NETWORK PERFORMANCE MEASUREMENT PARAMETERS

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- To ensure optimized network performance, the most important criterion should be selected for measurement. Many of the parameters included in a comprehensive network performance measurement solution focus on data speed and data quality. Both of these broad categories can significantly impact end user experience and are influenced by several factors.

NETWORK PERFORMANCE MEASUREMENT PARAMETERS

Latency

With regards to network performance measurement, latency is simply the **amount of time it takes for data to travel from one defined location to another**. This parameter is sometimes referred to as delay. Ideally, the latency of a network is as close to zero as possible. The absolute limit or governing factor for latency is the speed of light, but packet queuing in switched networks and the refractive index of fiber optic cabling are examples of variables that can increase latency.

NETWORK PERFORMANCE MEASUREMENT PARAMETERS

- **Packet Loss**

With regards to network performance measurement, packet loss refers to the number of packets transmitted from one destination to another that fail to transmit. This metric can be quantified by capturing traffic data on both ends, then identifying missing packets and/or retransmission of packets. Packet loss can be caused by network congestion, router performance and software issues, among other factors.

NETWORK PERFORMANCE MEASUREMENT PARAMETERS

Throughput and Bandwidth

- For network performance measurement, throughput is defined in terms of the amount of data or number of data packets that can be delivered in a pre-defined time frame.
- Bandwidth, usually measured in bits per second, is a characterization of the amount of data that can be transferred over a given time period. Bandwidth is therefore a measure of capacity rather than speed. For example, a bus may be capable of carrying 100 passengers (bandwidth), but the bus may actually only transport 85 passengers (throughput).

NETWORK PERFORMANCE MEASUREMENT PARAMETERS

Jitter

- Jitter is defined as the variation in time delay for the data packets sent over a network. This variable represents an identified disruption in the normal sequencing of data packets. Jitter is related to latency, since the jitter manifests itself in increased or uneven latency between data packets, which can disrupt network performance and lead to packet loss and network congestion. Although some level of jitter is to be expected and can usually be tolerated, quantifying network jitter is an important aspect of comprehensive network performance measurement.

FACTORS AFFECTING NETWORK PERFORMANCE

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- **Infrastructure**

- The overall network infrastructure includes network hardware, such as routers, switches and cables, networking software, including security and operating systems as well as network services such as IP addressing and wireless protocols. From the infrastructure perspective, it is important to characterize the overall traffic and bandwidth patterns on the network. This network performance measurement will provide insight into which flows are most congested over time and could become potential problem areas.
- Identifying the over-capacity elements of the infrastructure can lead to proactive corrections or upgrades that can minimize future downtime rather than simply responding to any performance crisis that may arise.

NETWORK PERFORMANCE MEASUREMENT PARAMETERS

- **Network Issues**

- Performance limitations inherent to the network itself are often a source of significant emphasis. Multiple facets of the network can contribute to performance, and deficiencies in any of these areas can lead to systemic problems. Since hardware requirements are essential to capacity planning, these elements should be designed to meet all anticipated system demands. For example, an inadequate bus size on the network backplane or insufficient available memory might in turn lead to an increase in packet loss or otherwise decreased network performance. Network congestion, on either the active devices or physical links (cabling) of the network can lead to decreased speeds, if packets are queued, or packet loss if no queuing system is in place.

NETWORK PERFORMANCE MEASUREMENT PARAMETERS

- **Applications**

- While network hardware and infrastructure issues can directly impact user experience for a given application, it is important to consider the impact of the applications themselves as important cogs in the overall network architecture. Poor performing applications can over-consume bandwidth and diminish user experience. As applications become more complex over time, diagnosing and monitoring application performance gains importance. Window sizes and keep-alives are examples of application characteristics that impact network performance and capacity.

NETWORK PERFORMANCE MEASUREMENT PARAMETERS

- **Security Issues**

- Network security is intended to protect privacy, intellectual property, and data integrity. Thus, the need for robust cybersecurity is never in question. Managing and mitigating network security issues requires device scanning, data encryption, virus protection, authentication and intrusion detection, all of which consume valuable network bandwidth and can impact performance

NETWORK PERFORMANCE MEASUREMENT TOOLS

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- Network performance measurement tools can be broadly categorized into two types - passive and active. Passive network measurement tools monitor (or measure) existing applications on the network to gather data on performance metrics. This category of tool minimizes network disruption, since no additional traffic is introduced by the tool itself. In addition, by measuring network performance using actual applications, a realistic assessment of the user experience may be obtained.
- Active networking performance measurement tools generate data that can be tailored to baseline performance using pre-set routines. This testing requires an additive level of data traffic by nature, so it must be scheduled appropriately to minimize impact on existing network traffic

NETWORK PERFORMANCE MEASUREMENT TOOLS

In this Workshop we are going to cover;

- Smokeping
- perfSonar

THANK YOU