

Optimizing Streaming Performance

More-Seamless Collaboration for Mobile Enterprises

As organizations become increasingly mobile, they are also increasing their use of real-time voice and video applications such as Skype, WebEx, Spark and other online conferencing applications. These types of applications rely on real-time data streams and are dependent on the quality of the end-to-end network connection. On congested Wi-Fi and cellular-data networks, user experience ranges from serviceable, through frustrating, to completely unusable.

NetMotion employs two technologies that can markedly improve the quality and productive use of streaming sessions in a mobile work environment.

Packet Loss Recovery

Packet Loss Recovery maintains the quality of a streaming session over connections that would otherwise be unusable. For enterprises that rely on voice-over-IP for communication or on video conferencing for team collaboration, mobile users and those on the wired corporate network are equally able to hear, see and participate reliably.

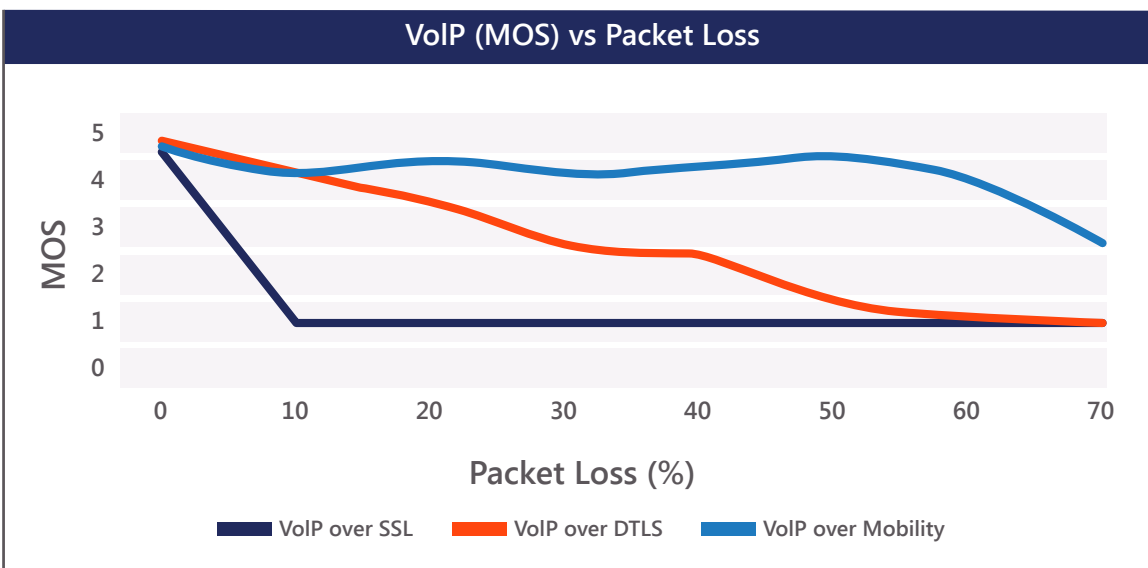
Quality of Service

Quality-of-Service (QoS) allows the organization to prioritize data flows that require real-time delivery, preventing less-critical traffic such as large file transfers or casual web browsing from degrading the voice or video. NetMotion implements QoS using two methods; one unique to NetMotion's VPN supporting QoS across all network types, and the other using 3GPP standards and requiring support by the network operator.

Example Uses

Here are some of the situations where NetMotion's streaming optimizations make a big difference:

- Voice-over-IP calls to or from devices in the field
- Audio/video conferencing where one or multiple parties are connected to mobile networks
- Real-time video collected by body-worn cameras or dashcams often used by first responders
- Field technicians accessing instructional videos, or collecting video for communicating field conditions
- Telehealth workers relying on streaming audio/video over mobile networks or Wi-Fi to bring virtual physician visits into rural areas



Mean-Opinion Score (MOS) is a measure of the perceived quality of communication. At a MOS of three or below, nearly all users of the service are dissatisfied. For VoIP over a standard connection, packet loss of 5% is unsatisfactory and by 10% the service is unusable. NetMotion PLR can maintain satisfactory performance with packet loss as high as 70%.

Understanding Packet Loss Recovery (PLR)

Dropped packets are a fact of life in every network, especially in wireless networks. With web, email and most other internet applications, the TCP/IP protocol automatically corrects for dropped packets by automatically requesting the sender retransmit them. But for real-time audio and video applications, the time required to request and retransmit packets may create a 'correction' that's worse than the original problem; that's why real-time streams use the UDP protocol which simply ignores lost packets. An occasional lost packet isn't necessarily detrimental, but a burst of lost packets within a short time is detrimental to the voice or video quality.

PLR automatically replaces dropped packets to improve real-time streaming on networks with high latency (the delay between sending and receiving a packet) or jitter (the degree to which latency varies). PLR adds information about adjacent packets to each packet sent using a sophisticated mathematical model. If the receiver detects dropped packets, PLR automatically reconstructs the lost packets with no perceptible change in quality.

By default, NetMotion Mobility applies PLR at a level that handles the packet loss typically encountered on cellular or WiFi networks. The tradeoff is a small increase in packet size and bandwidth used. The PLR level is tunable for local conditions using policy settings, allowing IT to tune the tradeoff between packets recovered and bandwidth used - globally, for groups, or specific users.

PLR applies a technique that was first described in the 1940s. It is an essential technology used for audio CDs, DVDs, various storage systems, and broadcast and satellite communications.

Understanding Quality of Service (QoS)

Within the NetMotion Mobility VPN tunnel, policy control allows administrators to prioritize network flows between the mobile device and the Mobility Server. There are five pre-defined QoS classifications. For instance, critical VoIP traffic can be assigned the Voice priority for optimum traffic-shaping, or assigned Best-Effort or Background priority if it is not an essential use of the network.

Over networks that support 3GPP prioritization standards, NetMotion Mobility can automatically assign DSCP (Differentiated Service Code Point) tags to higher-priority, real-time data traffic. NetMotion's ability to dynamically tag packets with a specific priority without requiring application vendors to modify their application is unique among VPNs.

Metric	Target
Latency (one way)	< 50ms
Latency (RTT or Round-trip Time)	< 100ms
Burst Packet Loss	<10% during any 200ms interval
Packet Loss	<1% during any 15s interval
Packet Inter-arrival Jitter	<30ms during any 15s interval
Packet Reorder	<0.05% out-of-order packets

Skype for Business Online Network Performance Requirements. Microsoft has established these maximum-allowable specifications for packet loss, latency and jitter in order to maintain voice and video quality.