SD-WAN PACKETS
How to Always Travel First Class

Imagine if every aspect of your air travel experience is first-class: Booking the reservation with ease; seat availability is completely open; the flight schedule perfectly matches your timeframe; cost is extremely reasonable; and the ticket purchasing process – relatively flawless.

On the plane, you sink into a plush leather seat with plenty of leg and arm room; the seat next to you, empty! And the flight lands well before the scheduled arrival time. Finally, your luggage is picked up and waiting for you along with your driver in a VIP destination.

While this perfect "QoE" scenario is a nice dream but rarely a reality, for certain SD-WAN solutions, managing packets dynamically over WAN infrastructure, that type of dream QoE can be a reality. Succinctly put, edge SD-WAN appliances (virtual or physical) are deployed at customer branch offices or remote sites for users accessing applications from corporate data centers and cloud sites. Edge devices are centrally managed by a controller that orchestrates virtual overlay tunnels over multiple network links of any type.

Beyond cost savings, agility, reliability and security, quality of experience (QoE) is a primary driver of SD-WAN deployments. We know not all SD-WANs are alike, and it is in the details associated with QoE that we find key differentiation. All SD-WAN solutions support multiple connections, but what varies is how they use those connections, the way WAN connection problems are handled, and the time it takes to move traffic away from a problem connection.

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Packets should receive first-class treatment in both directions

Most SD-WANs include policy-based routing to predetermine paths based on bandwidth and latency assumptions. Unfortunately, actual network conditions often don't conform to predefined assumptions. It is the ability to combine predetermined outcome, intent or application-level policies with microsecond knowledge of actual network performance that ensures great QoE.

Some SD-WANs base path decisions on latency measured using a round-trip ping. However, round trip measurement discounts the possibility that traffic could take different routes in both directions and that each direction can vary drastically in latency, packet loss and bandwidth. An SD-WAN that measures the loss, latency and jitter of every path in each direction separately creates a complete and distinct network map. With this information, more intelligent path decisions can be made.

QoE ensures equivalent application quality when moving links

Can you imagine flying from San Francisco to Singapore and your connecting flight in Japan moves you from the comfort of a Dreamliner to a cramped crop-jet that carries 14 passengers? Your arrival will be extended due to a slower aircraft that battles strong headwinds. And to make matters worse, they've lost your luggage! This scenario is not unlike the last-mile world of packets traveling over traditional WANs.

SD-WAN intelligent routing is intended to make better use of all available bandwidth. The most simplistic routing mimics load balancing by assigning individual sessions to a path often without regard to link characteristics and application requirements. Somewhat more sophisticated SD-WANs route traffic by the packet. But both approaches may result in poor application quality if traffic is moved to dissimilar links, such as from MPLS to cable. Latency and bandwidth between the two will often vary widely. Packet load balancing without WAN link intelligence can result in out of order packets and high loss risk. This can lead to more retransmits and performance that is actually worse than no load balancing at all.

An SD-WAN with intelligent routing and the necessary mapping of current network conditions is deterministic and adaptive in that it will spread a single session across multiple links only when the end result will improve performance. It will adapt to changing conditions and move packets off links as quality degrades or links fail, without disrupting the session. Loss mitigation and reorder control will also help compensate for dissimilar link characteristics.

Session- and path-layer, and WAN-link intelligence directly impact QoE

SD-WAN solutions that only use path intelligence will detect a problem with the WAN and move packets to a better performing link. Unfortunately, when using traditional probing and routing methods, the process can cause delays that impact user sessions.

While path intelligence moves all network traffic from a failed link to a working link, it's not well-suited for moving applications that are sensitive to packet loss and network congestion. Path intelligence has no inherent application awareness to address specific characteristics and requirements for real-time apps like VoIP that need low loss and jitter. Some apps, like file transfers, don't have such requirements and can run over the least-expensive, high-bandwidth links. Because of the delays caused by path intelligence methods, user sessions and therefore applications can become slow and unreliable.

Session-layer intelligence monitors each session's performance and moves traffic to the best link based on application type, not unlike basic load balancing. The ability to associate packets and flows with a unique session and manage that session helps keep traffic running optimally. Because session intelligence is application-aware, it can conduct session buffering to avoid the performance problems caused by packet loss, eliminate jitter and enable a smooth app recovery process.

One challenge associated with session intelligence is session-level SLA thresholds that may change based on different underlying network behaviors, such as site-to-site latency.

Talari QoS: session layer, path layer, WAN link Intelligence (1+1+1=6)

Using path-layer intelligence, Talari instruments and monitors every packet at the path level. By continually detecting, measuring and analyzing the WAN path for each packet, regardless of sessions, the path can be adjusted after seeing trends in as little as 2 or 3 packets. Talari is able to accomplish this technique by receiving a packet on a path every few microseconds (not milliseconds).

Talari also utilizes session-layer intelligence to buffer and monitor each session and adjust sessions according to bandwidth availability without impacting end users. Talari also accounts for path independence in factoring its WAN-path optimization.

Talari WAN-link intelligence provides first- and last mile-bandwidth and congestion monitoring to provide insights into link characteristics and dynamic conditions that cause latency, jitter and packet loss. Based on a complete understanding of link characteristics, conditions and policies, Talari enforces policies on the packet transition process and moves packets to better performing links – in a fraction of a second.

So when network conditions change, Talari discerns those change quickly, adjusting sessions to use the network differently. Combining session layer, path layer and WAN link intelligence with QoS, delivers packets – and therefore users – first class accommodations so that application responses are fast, secure and reliable.

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TALARI Networks

Talari Networks, Inc.
1 Almaden Blvd, Suite 200
San Jose Ca, 95113

Phone: +1 408.689.0400
info@talari.com
www.talari.com

SOLUTION-OVERVIEW-201707-007