One-way Delay Measurement Based on Reference Delay

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- End-to-end one-way delay (OWD) measurement: E2E OWD is an important performance indicator for SLA guarantee.

- An example: HD video surveillance service scenario in 5G network. The end-to-end one-way delay is the sum of $T_1 + T_2 + T_3 + T_4$.

Sender to Receiver Network: End-to-end one-way delay from the sender to the receiver is measured. Intermediate devices other than the sender and receiver are hidden for simplicity.

Reference Packet: The E2E one-way delay for reference pkt is stable and bounded, denoted as $D_{ref}$.

Target Packet: The E2E one-way delay for target pkt is the measurement target, denoted as $D_{target}$.

Timestamping: We timestamp reference and target pkt on the sender and receiver side respectively, denoted as $T_{s1}$, $T_{s2}$, $T_{r1}$ and $T_{r2}$.

For reference packet and target packet, we can get Equation 1 and Equation 2, respectively.

$$T_{r1} - T_{s1} = D_{ref} + Offset_1$$ (1)

$$T_{r2} - T_{s2} = D_{target} + Offset_2$$ (2)

When sending time interval between reference and target pkt is small, $Offset_1 = Offset_2$.

(Equation 2 – Equation 1), we get Equation 3. Now we can calculate $D_{target}$.

$$D_{target} = (T_{r2} + T_{s1}) - (T_{r1} + T_{s2}) + D_{ref}$$ (3)