IPFIX Protocol over QUIC

draft-llg-opsawg-ipfix-over-quic-01

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IETF-124, November 2025

Why IPFIX Chooses QUIC

- Reliability & congestion control (comparable to SCTP/TCP)
- Built-in TLS 1.3 encryption for end-to-end security
- Multi-streaming within a single connection, eliminating head-of-line blocking
- Faster handshake: 1–2 RTT (vs. TCP’s 3, SCTP’s 4)
- Dynamic MTU adaptation to reduce fragmentation loss
- Seamless connection migration under changing IPs (e.g., mobile networks)
- Flexible user-space deployment, avoiding kernel dependencies

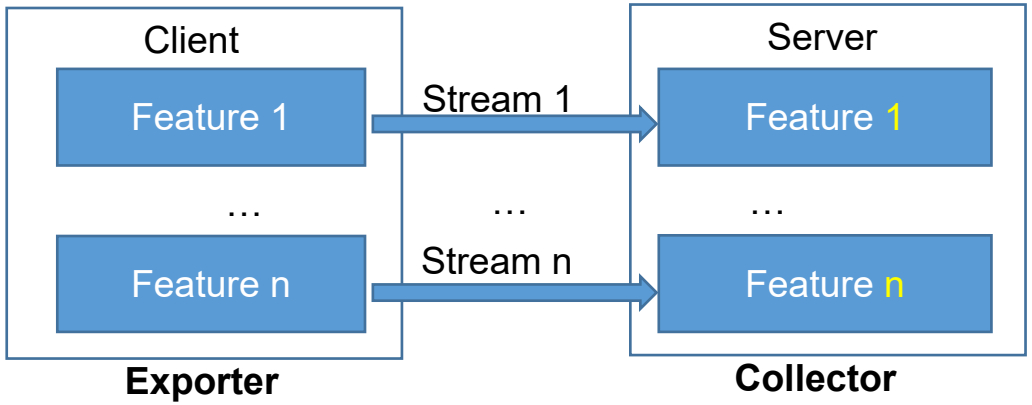
Operational Benefits for IPFIX over QUIC

- **Simplified Security:** Integrated TLS eliminates extra encryption layers
- **Efficient Transport:** Multi-streaming enables parallel flow record export
- **Resilience in Mobility:** Stable sessions across network changes
- **Optimized Performance:** Adaptive MTU + reduced latency
- **Future-Ready Design:** Evolvable user-space implementation without kernel updates

Single vs. Mutiple Streams

Unidirectional Stream (Baseline)

- Follows [RFC5470] architecture for IP Flow data export
- IPFIX Messages (Data Records & Templates) are:
  - ✓ Initiated solely by Exporter
  - ✓ Require no Collector response
  - ✓ Mapped to single QUIC unidirectional stream
- Simple client (Exporter) to server (Collector) transmission model



Multiple Streams (Enhanced)

- Enables concurrent transmission within one QUIC connection
- Exporting Process may create multiple streams to:
  - ✓ Significantly improve transmission efficiency
  - ✓ Enhance overall performance
- Stream differentiation based on IP Flow characteristics:
  - ✓ Five-tuple information
  - ✓ Transport layer protocol type
  - ✓ Source/destination IP address ranges
  - ✓ Template classification

Stream Management

Connection Scaling Mechanism

- Follows [RFC5470] architecture for IP Flow data export
- When stream count exceeds QUIC connection limits:
  - ✓ New QUIC connection automatically established
  - ✓ Maintains continuous data export capability
  - ✓ Ensures system scalability

Key Advantages of Multi-Stream Approach

- Eliminates head-of-line blocking between different flow types
- Enables quality-of-service differentiation
- Provides inherent data classification and isolation
- Supports flexible load distribution across streams
- Maintains backward compatibility with single-stream mode

Operational Considerations

- **Configuration Parameters**
  - ✓ Enable IPFIX over QUIC as an optional transmission protocol per session
  - ✓ Fallback to alternative transport protocols if QUIC connection fails
  - ✓ For multi-stream mode support feature configuration per stream
- **Congestion Avoidance**
  - ✓ If the transmission buffer is full, the Exporting Process may drop Data Records to prevent blocking
  - ✓ Dropped records MUST be accounted for to enable accurate loss reporting
- **Failover Mechanisms**
  - ✓ QUIC automatically retries connection establishment with exponential backoff on failure
  - ✓ Exporters MAY log alarms if QUIC connection times out For Collecting Process failover
  - ✓ Exporters MAY pre-establish a backup QUIC connection to ensure continuity

Next Steps

- Seeking broader review and feedback from WG
- Welcome involved to help refine and advance this proposal

Thanks!