IPFIX in 180 seconds

- Message-oriented export over SCTP, TCP, UDP
- Flexible, self-describing templated format
- Efficient rep. of high-volume data w/ low semantic variability
Templates and IEs

- Data set IDs refer to Template IDs describing their structure

- Information Elements (IEs) in extensible IANA registry covering most common network elements
IPFIX + LMAP

- Exporting Process (EP) at MA
- Collecting Process (CP) at collector
- Use existing Message Header fields for certain parameters:
  - Test time in IPFIX Export Time
  - MA identifier as Observation Domain ID
- New IEs for parameters ➔ new IPPM registry
Example

- Example: MA reporting UDP latency test:
  - 192.0.2.1:23677 -> 203.0.113.1:34567
  - 1pps uniform periodic, no cross traffic
  - 3sec, start @ 08:00:00 UTC
  - Latency with millisecond precision

- Test result looks like an IPFIX flow:
  - Timing given by flow interval
  - Additional IEs needed for test params
Template

- *metricIdentifier [⇒ metric in new IPPM registry]
- *testSchedule [⇒ new IPPM registry §3]
- *scheduleRate [events/sec]
- *outputType [raw, interval, mean ⇒ new IPPM registry §4]
- *testEnvironment [⇒ new IPPM registry §5]
- *sourceIPv4Address
- *destinationIPv4Address
- *sourceTransportPort
- *destinationTransportPort
- flowStartMilliseconds [singleton latency given by this interval]
- flowEndMilliseconds
Data Record

- *metricIdentifier = UDP latency
- *testSchedule = periodic
- *scheduleRate = 1.0
- *outputType = raw
- *testEnvironment = no cross-traffic
- *sourceIPv4Address = 192.0.2.1
- *destinationIPv4Address = 23677
- *sourceTransportPort = 203.0.113.1
- *destinationTransportPort = 34567
- flowStartMilliseconds = 08:00:00.019
- flowEndMilliseconds = 08:00:00.169 → 150ms latency
IPFIX Options

Options Template Record (Set ID = 3)

<table>
<thead>
<tr>
<th>Template ID = 257</th>
<th>Count = n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope Count = 1</td>
<td></td>
</tr>
<tr>
<td>Scope IE0</td>
<td>Length0</td>
</tr>
<tr>
<td>IE1</td>
<td>Length1</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>IE_{n-1}</td>
<td>Length_{n-1}</td>
</tr>
</tbody>
</table>

Template Record (Set ID = 2)

<table>
<thead>
<tr>
<th>Template ID = 258</th>
<th>Count = n</th>
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</thead>
<tbody>
<tr>
<td>IE0</td>
<td>Length0</td>
</tr>
<tr>
<td>IE1</td>
<td>Length1</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>IE_{n-1}</td>
<td>Length_{n-1}</td>
</tr>
</tbody>
</table>

Data Set

<table>
<thead>
<tr>
<th>Set ID = 257</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Record</td>
<td></td>
</tr>
<tr>
<td>value0</td>
<td>value1</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>value_{n-1}</td>
<td></td>
</tr>
</tbody>
</table>

Data Set

<table>
<thead>
<tr>
<th>Set ID = 258</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Record</td>
<td></td>
</tr>
<tr>
<td>value0</td>
<td>value1</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>value_{n-1}</td>
<td></td>
</tr>
</tbody>
</table>
Applying Options

- "raw" records
- exported records

common properties
(e.g. test parameters)

per-record properties
(e.g. results)
Template w/Options

- testIdentifier [scope]
- *metricIdentifier
- *testSchedule
- *scheduleRate
- *outputType
- *testEnvironment
- *sourceIPv4Address
- *destinationIPv4Address
- *sourceTransportPort
- *destinationTransportPort
- testIdentifier [scope]
- flowStartMilliseconds
- flowEndMilliseconds
Other Considerations

- Options increase efficiency...
  - ...and representation complexity
- Collector in-degree / federation via mediators