

IPFIX Flow Aggregation

draft-dressler-ipfix-aggregation-05.txt

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Aggregation

- Two independent steps

- Flow Selection

- which flows are eligible for aggregation?

Src IP	Src Port	Dst IP	Dst Port	Pkts
192.0.2.1	64235	192.0.2.101	80	10
192.0.2.2	64236	192.0.2.102	110	10
192.0.2.3	64237	192.0.2.103	80	10
192.0.2.101	64238	192.0.2.1	80	10
192.0.2.101	64239	192.0.2.2	80	10

- Compound Flow creation

- which fields should be present in exported flows?

Src IP	Src Port	Dst IP	Dst Port	Pkts
192.0.2.1	64235	192.0.2.101	80	10
192.0.2.2	64236	192.0.2.102	110	10
192.0.2.3	64237	192.0.2.103	80	10
192.0.2.101	64238	192.0.2.1	80	10
192.0.2.101	64239	192.0.2.2	80	10

Flow Selection

- Principle
 - For each desired stream of Compound Flows:
 - Compare incoming Flows with patterns
 - Matching ones contribute to Compound Flows
- Size Reduction
 - Selection criteria can be removed from Records
 - Selection criteria are Common Properties!

Example

Information Element	Flow Selection
sourceIPv4Address	
destinationIPv4Address	192.0.2.0/28
destinationTransportPort	80
packetDeltaCount	

Src IP	Src Port	Dst IP	Dst Port	Pkts
192.0.2.1	64235	192.0.2.101	80	10
192.0.2.2	64236	192.0.2.102	110	10
192.0.2.3	64237	192.0.2.103	80	10
192.0.2.101	64238	192.0.2.1	80	10
192.0.2.101	64239	192.0.2.2	80	10

Example

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192.0.2.101	64238	192.0.2.1	80	10
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Example

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192.0.2.101	64238	192.0.2.1	80	10
192.0.2.101	64239	192.0.2.2	80	10

Src IP	Src Port	Dst IP	Pkts		Dst IP	Dst Port
192.0.2.101	64238	192.0.2.1	10	+	192.0.2.0/28	80
192.0.2.101	64239	192.0.2.2	10		(as Common Properties)	

Compound Flow creation

- Principle
 - For each desired stream of Compound Flows:
 - Configure a Template, typically with less IEs
 - IEs are copied in full or in part(!) from source flows
 - Superfluous IEs in incoming Flows are discarded
- Size Reduction
 - Less Information Elements mean smaller Records
 - (Now) identical Flows can be merged

Example

Information Element	Flow Selection	Compound Flow Creation
sourceIPv4Address		keep
destinationIPv4Address	192.0.2.0/28	mask to 30 bit
destinationTransportPort	80	discard
packetDeltaCount		aggregate

Src IP	Src Port	Dst IP	Dst Port	Pkts
192.0.2.1	64235	192.0.2.101	80	10
192.0.2.2	64236	192.0.2.102	110	10
192.0.2.3	64237	192.0.2.103	80	10
192.0.2.101	64238	192.0.2.1	80	10
192.0.2.101	64239	192.0.2.2	80	10

Example

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192.0.2.101	64238	192.0.2.1	80	10
192.0.2.101	64239	192.0.2.2	80	10

Example

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sourceIPv4Address		keep
destinationIPv4Address	192.0.2.0/28	mask to 30 bit
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192.0.2.101	64238	192.0.2.1	80	10
192.0.2.101	64239	192.0.2.2	80	10

Src IP	Dst IP	Pkts	+	Dst IP	Dst Port
192.0.2.101	192.0.2.0/30	20		192.0.2.0/28	80

(as Common Properties)

Mediator-Specific Extensions to IPFIX Protocol and Information Model

draft-sommer-ipfix-mediator-ext-01.txt

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Motivation

- Efficient Transport of
 - Compound Flows
 - Selection Criteria
- This I-D introduces
 - new ADTs: `orderedList`, `orderedPair`, `portRanges`
 - new ADT: `ipv4Network`
 - new IE: `excludedPropertiesId`

New ADT orderedList

- Old: Use one new Template per List length
- New: Use one IE
 - represents ordered collection of IEs
 - all of same type and length
 - allow reduced-size encoding if only one element

Human-Readable	Octets	Hexadecimal	Remarks
80	1	50	Reduced-size encoding
80	2	0050	
80, 443	4	0050 01BB	
80, 443, 8080	6	0050 01BB 1F90	

New ADT orderedPair

- Old: Two IEs at arbitrary positions in record
- New: Use one IE
 - represents 2-tuple of IEs
 - both of same type and length
 - allow reduced-size encoding if elements identical

Human-Readable	Octets	Hexadecimal	Remarks
80, 80	1	50	Reduced-size encoding
80, 80	2	0050	Reduced-size encoding
80, 80	4	0050 0050	
80, 443	4	0050 01BB	

New ADT portRanges

- Usable for e.g. transportDestinationPort
 - orderedList of orderedPairs of unsigned16s
 - same rules regarding reduced-size encoding apply, hence: downwards-compatible to unsigned16

Human-Readable	Octets	Hexadecimal
80	1	50
1:7	4	0001 0007
80, 443	8	0050 0050 01BB 01BB
1:7, 256:1024	8	0001 0007 0100 0400
20, 80, 443	12	0014 0014 0050 0050 01BB 01BB
1:7, 80, 443	12	0001 0007 0050 0050 01BB 01BB

New ADT ipv4Network

- Old: Two IEs at arbitrary positions in record
- New: Use one IE
 - represents both IPv4 address/mask
 - allow reduced-size encoding for n×8-Byte Zeroes
hence: downwards-compatible to ipv4Address

Human-Readable	Octets	Hexadecimal	Remarks
192.0.2.0/24	3	C0 00 02	Reduced-size encoding
192.0.2.1	4	C0 00 02 01	Reduced-size encoding
192.0.2.0/30	5	C0 00 02 00 1E	

New IE excludedPropertiesId

- Old: No complement of commonPropertiesId
- New: Ability to specify
 - non-considered, discarded, or “out-of-scope”-data

Src Port	Dst Port	Src IP	Dst IP
80	65432	not 192.0.2.1	192.0.2.2

New IE excludedPropertiesId

- Old: No complement of commonPropertiesId
- New: Ability to specify
 - non-considered, discarded, or “out-of-scope”-data

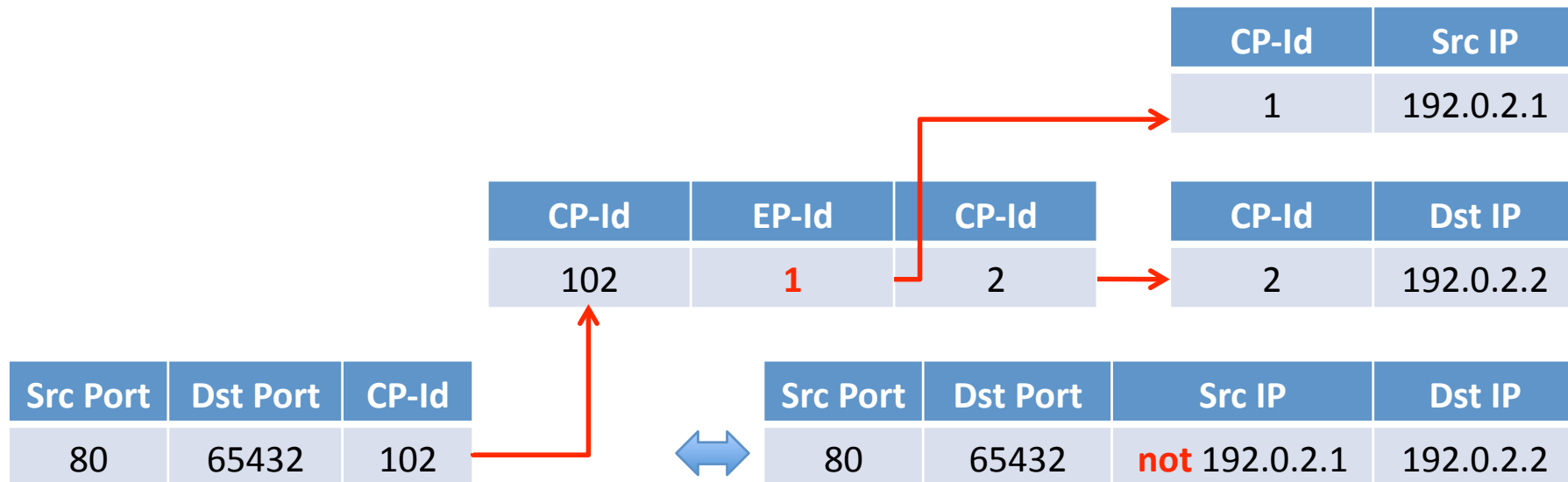
Src Port	Dst Port	CP-Id
80	65432	102



Src Port	Dst Port	Src IP	Dst IP
80	65432	not 192.0.2.1	192.0.2.2

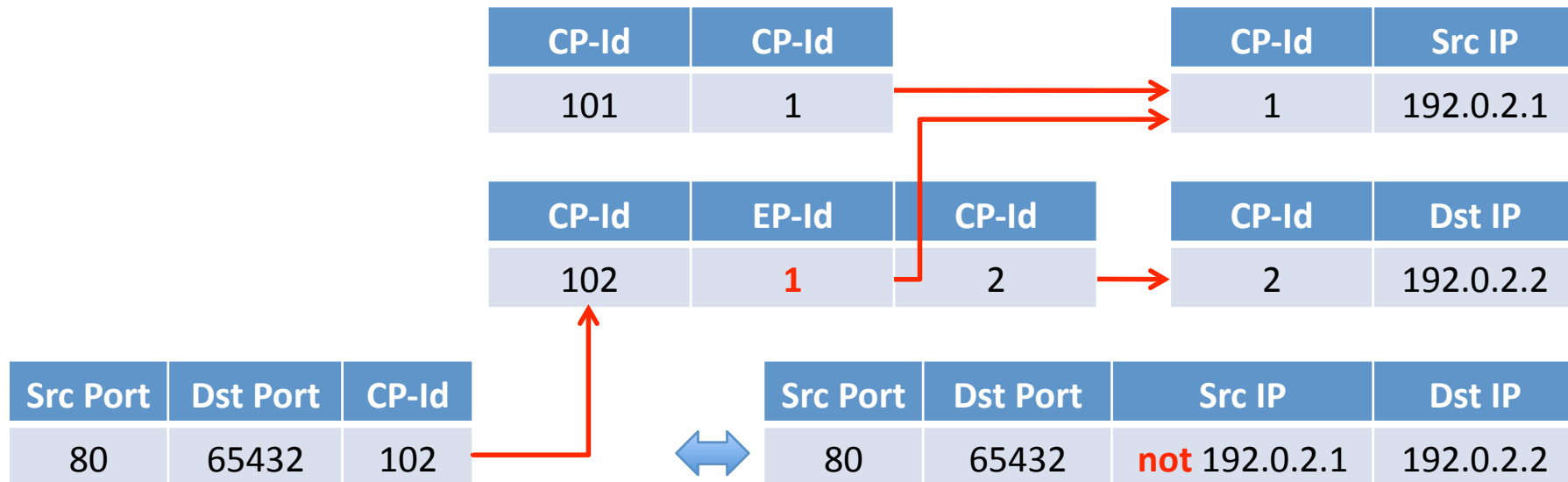
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Rich Template Set

Extension to the IPFIX Protocol

draft-sommer-ipfix-richtemplate-00.txt

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Motivation

- Transport of Common Properties
 - already works, but: Comparatively costly
- Rich Template
 - extends regular Template
 - both declares and defines Common Properties
 - provides an Id to refer to these properties

Rich Template Set

- Identical to Template Set (Set ID 2)
- Individual records define Rich Templates

0..	..15	16..	..31
Set ID = 4		Length	
Rich Template Record 1			
...			
Rich Template Record N			
Padding (opt)			

Rich Template

0..	..15	16..	..31
Template ID (>255)		Field Count	
Data Count		commonPropertiesId	
Field 1 Specifier			
...			
Field N Specifier			
Data 1 Specifier			
...			
Data M Specifier			
Data 1 Value			
...			
Data M Value			

Example

0..	..15	16..	..31
Template ID (>255)		Field Count	
Data Count		commonPropertiesId	
Field 1 Specifier			
...			
Field N Specifier			
Data 1 Specifier			
...			
Data M Specifier			
Data 1 Value			
...			
Data M Value			

0..	..15	16..	..31
Template ID = 256		Field Count = 3	
Data Count = 2		CP-Id= 1	
sourceIPv4Address			
sourceTransportPort			
packetDeltaCount			
destinationIPv4Address			
destinationTransportPort			
Dst IP = 192.0.2.1			
Dst Port = 80			

Summary

- Aggregation
 - Flow Selection
 - Compound Flow creation
- Mediator-specific Extensions
 - orderedList, orderedPair
 - portRanges, ipv4Network
 - excludedPropertiesId
- Rich Template Set
 - declares and defines Common Properties