FloCon 2024

20th Annual Open Forum for Large-Scale Data Analytics

Using Data to Defend

Fusing AWS VPC Flow Logs and Traditional Netflow

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Document Markings

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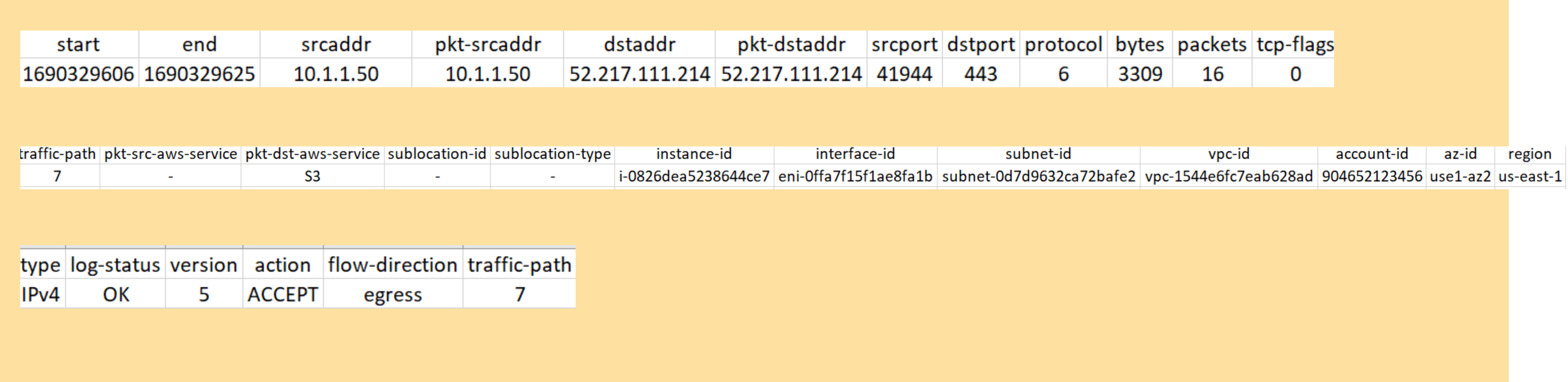
Agenda

- AWS VPC Flow Logs vs. Traditional Flow Sensor
- Collection Opportunities
- Fusion into Single Repository
- Future Implementation and Next Steps

AWS VPC Flow Logs Intro

- AWS VPC flow logs come from AWS
  - Collection at interfaces, instances, vpc-wide
- Text based Comma Separated Values
- ~200 bytes per record
- Broken into flow, cloud, and metadata fields

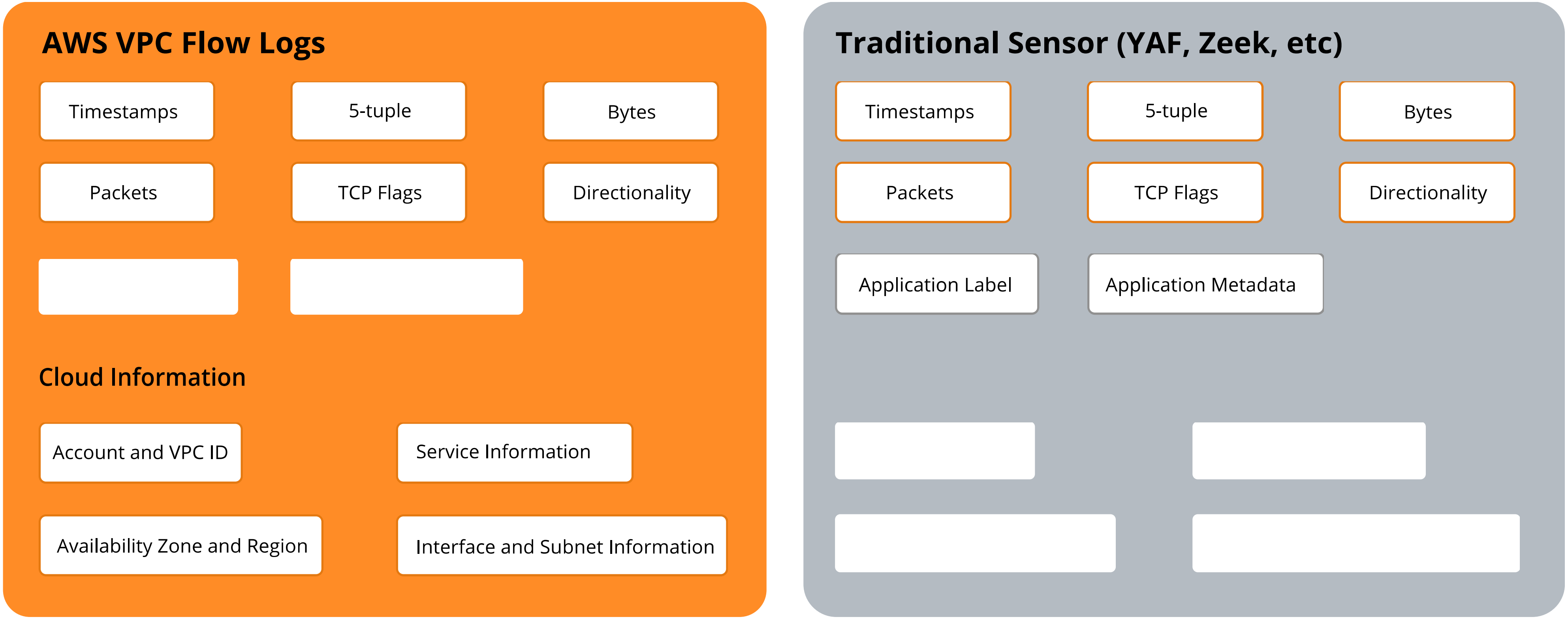


start	end	srcaddr	pkt-srcaddr	dstaddr	pkt-dstaddr	srcport	dstport	protocol	bytes	packets	tcp-flags
1690329606	1690329625	10.1.1.50	10.1.1.50	52.217.111.214	52.217.111.214	41944	443	6	3309	16	0

traffic-path	pkt-src-aws-service	pkt-dst-aws-service	sublocation-id	sublocation-type	instance-id	interface-id	subnet-id	vpc-id	account-id	az-id	region
7	-	S3	-	-	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	subnet-0d7d9632ca72bafe2	vpc-1544e6fc7eab628ad	904652123456	use1-az2	us-east-1

type	log-status	version	action	flow-direction	traffic-path
IPv4	OK	5	ACCEPT	egress	7

AWS VPC Flow Logs vs Traditional Sensor



AWS VPC Flow Logs

- Timestamps
- 5-tuple
- Bytes
- Packets
- TCP Flags
- Directionality

Cloud Information

- Account and VPC ID
- Service Information
- Availability Zone and Region
- Interface and Subnet Information

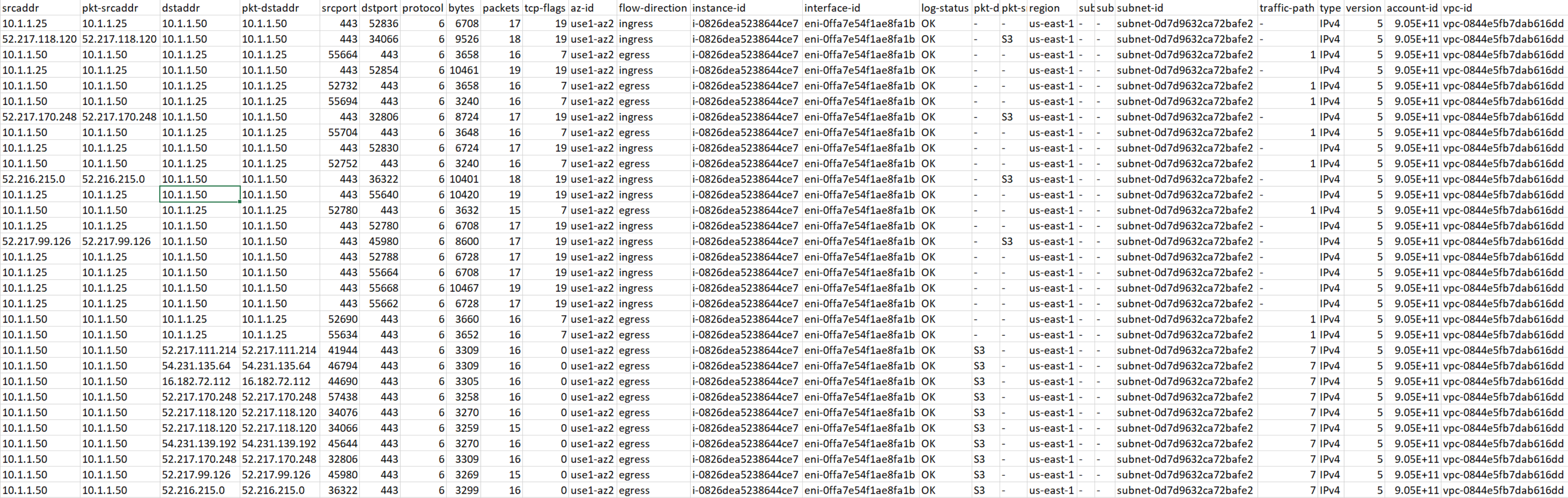
Traditional Sensor (YAF, Zeek, etc)

- Timestamps
- 5-tuple
- Bytes
- Packets
- TCP Flags
- Directionality
- Application Label
- Application Metadata

AWS VPC Flow Logs “Cloud Fields” - At Least 137 Bytes

Field Name	Bytes/Characters in CSV*	Level	Example
version	1	2	1,2,3,4,5
interface-id	21	2	eni-0a7d978d39bba1620
account-id	12	2	123456789123
Action	6	2	“ACCEPT” or “REJECT”
log-status	Typically 2	2	“OK”, “NODATA”, or “SKIPDATA”
vpc-id	21	3	vpc-0dd4fd42a389a5a79
subnet-id	24	3	subnet-0a5397bcdecc7e2cc
type	4	3	“IPv4”, “IPv6”, or “EFA”
region	9	4	us-east-1
az-id	7	4	use1-az2
sublocation-type	Usually 1	4	Usually “-”
sublocation-id	Usually 1	4	Usually “-”
pkt-src-aws-service	Usually 1; 3-10	5	“-” |CLOUD9 |DYNAMODB|EC2 | KINESIS_VIDEO_STREAMS | ROUTE53 | S3
pkt-dst-aws-service	Usually 1; 3-10	5	“-” |CLOUD9 |DYNAMODB|EC2 | KINESIS_VIDEO_STREAMS | ROUTE53 | S3
flow-direction	6 or 7	5	“ingress” or “egress”
traffic-path	1	5	1,2,3,4,5,6,7 or 8

Snapshot of AWS VPC Flow Logs



srcaddr	pkt-srcaddr	dstaddr	pkt-dstaddr	srcport	dstport	protocol	bytes	packets	tcp-flags	az-id	flow-direction	instance-id	interface-id	log-status	pkt-d	pkt-s	region	sub	sub	subnet-id	traffic-path	type	version	account-id	vpc-id
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52836	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
52.217.118.120	52.217.118.120	10.1.1.50	10.1.1.50	443	34066	6	9526	18	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55664	443	6	3658	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52854	6	10461	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52732	443	6	3658	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55694	443	6	3240	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
52.217.170.248	52.217.170.248	10.1.1.50	10.1.1.50	443	32806	6	8724	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55704	443	6	3648	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52830	6	6724	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52752	443	6	3240	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
52.216.215.0	52.216.215.0	10.1.1.50	10.1.1.50	443	36322	6	10401	18	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55640	6	10420	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52780	443	6	3632	15	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52780	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
52.217.99.126	52.217.99.126	10.1.1.50	10.1.1.50	443	45980	6	8600	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52788	6	6728	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55664	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55668	6	10467	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55662	6	6728	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52690	443	6	3660	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55634	443	6	3652	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	52.217.111.214	52.217.111.214	41944	443	6	3309	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	54.231.135.64	54.231.135.64	46794	443	6	3309	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	16.182.72.112	16.182.72.112	44690	443	6	3305	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	52.217.170.248	52.217.170.248	57438	443	6	3258	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	52.217.118.120	52.217.118.120	34076	443	6	3270	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	52.217.118.120	52.217.118.120	34066	443	6	3259	15	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	54.231.139.192	54.231.139.192	45644	443	6	3270	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	52.217.170.248	52.217.170.248	32806	443	6	3309	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	52.217.99.126	52.217.99.126	45980	443	6	3269	15	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd
10.1.1.50	10.1.1.50	52.216.215.0	52.216.215.0	36322	443	6	3299	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.05E+11	vpc-0844e5fb7dab616dd

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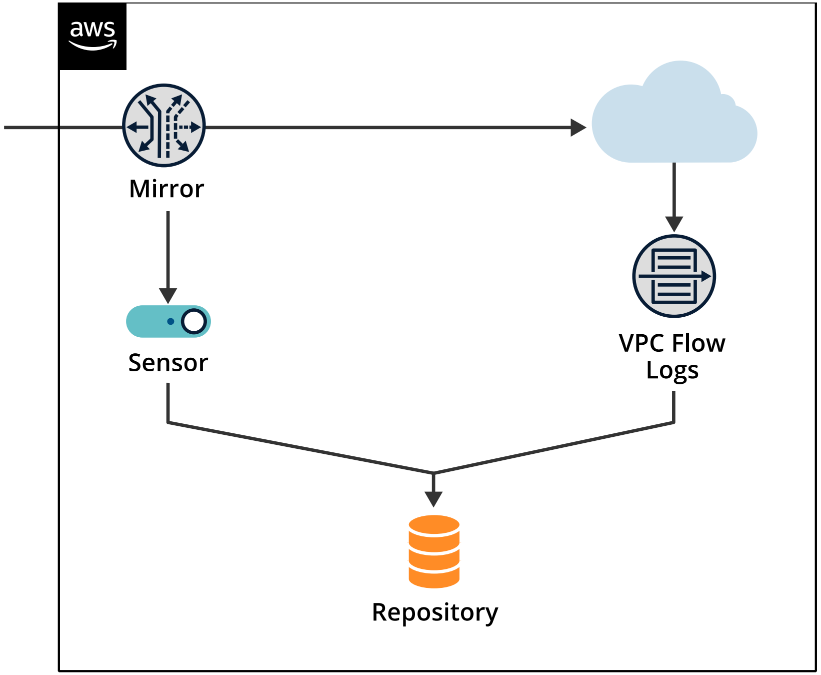
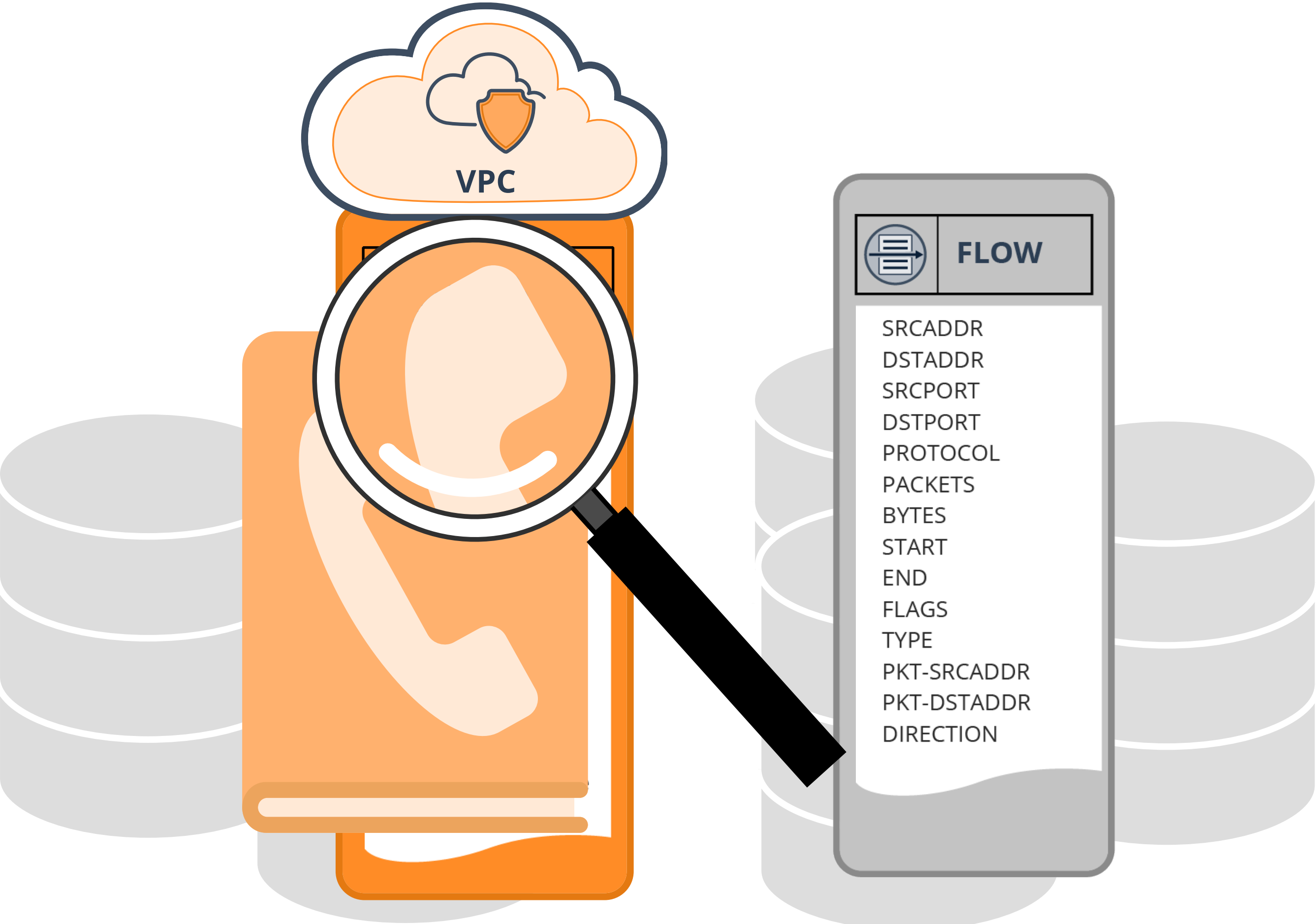
Ultimate Goal



- Single repository
- Retain all information
- Remove redundancy
- Conserve Storage
- Present one view to analysts
- Utilize single set of analysis tools

SiLK on the scene



SRCADDR
DSTADDR
SRCPORT
DSTPORT
PROTOCOL
PACKETS
BYTES
START
END
FLAGS
TYPE
PKT-SRCADDR
PKT-DSTADDR
DIRECTION

Map from Flow to Cloud fields

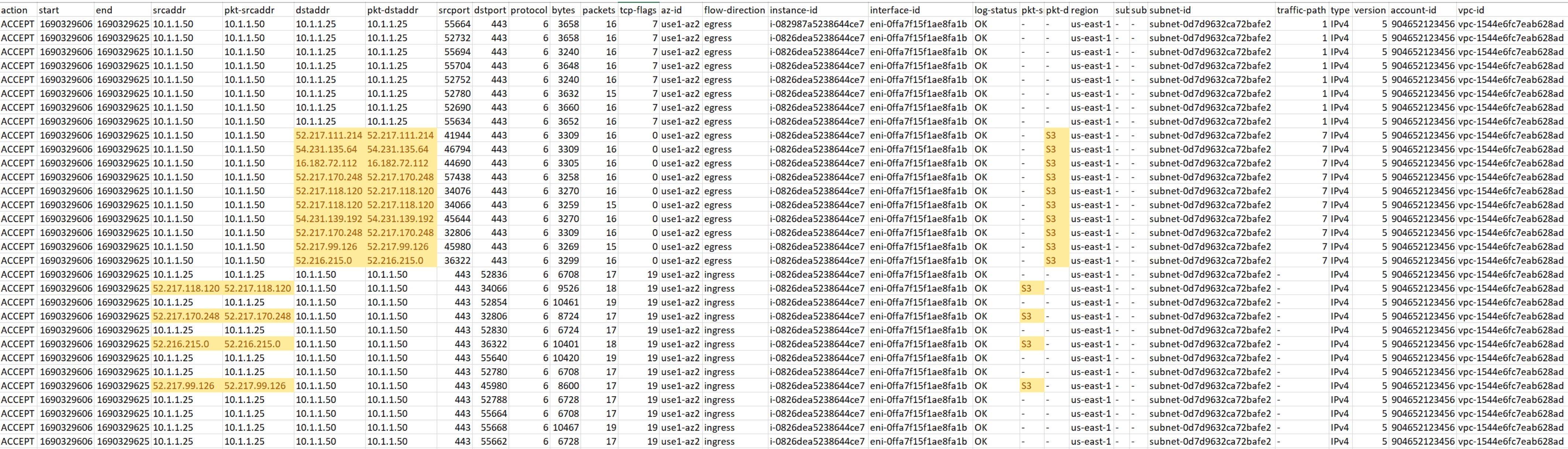
Cloud fields are typically at least **137** bytes per record

- Used in **filtering**: “Look at all traffic to and from S3”
- Used in **enrichment**: “Add cloud information to these flows of interest”

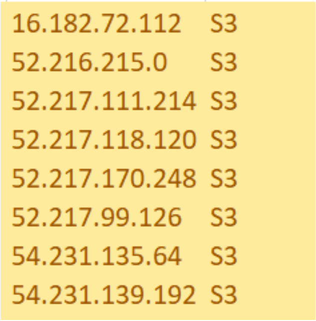
Convert to two-way lookup

- Use IP as the key and cloud field +timestamp as value

Sorted For Directionality – S3 Labeling



action	start	end	srcaddr	pkt-srcaddr	dstaddr	pkt-dstaddr	srcport	dstport	protocol	bytes	packets	tcp-flags	az-id	flow-direction	instance-id	interface-id	log-status	pkt-s	pkt-d	region	sub	sub	subnet-id	traffic-path	type	version	account-id	vpc-id
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55664	443	6	3658	16	7	use1-az2	egress	i-082987a5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52732	443	6	3658	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55694	443	6	3240	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55704	443	6	3648	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52752	443	6	3240	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52780	443	6	3632	15	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52690	443	6	3660	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55634	443	6	3652	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	52.217.111.214	52.217.111.214	41944	443	6	3309	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	54.231.135.64	54.231.135.64	46794	443	6	3309	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	16.182.72.112	16.182.72.112	44690	443	6	3305	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	52.217.170.248	52.217.170.248	57438	443	6	3258	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	52.217.118.120	52.217.118.120	34076	443	6	3270	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	52.217.118.120	52.217.118.120	34066	443	6	3259	15	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	54.231.139.192	54.231.139.192	45644	443	6	3270	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	52.217.170.248	52.217.170.248	32806	443	6	3309	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	52.217.99.126	52.217.99.126	45980	443	6	3269	15	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.50	10.1.1.50	52.216.215.0	52.216.215.0	36322	443	6	3299	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52836	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	52.217.118.120	52.217.118.120	10.1.1.50	10.1.1.50	443	34066	6	9526	18	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52854	6	10461	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	52.217.170.248	52.217.170.248	10.1.1.50	10.1.1.50	443	32806	6	8724	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52830	6	6724	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	52.216.215.0	52.216.215.0	10.1.1.50	10.1.1.50	443	36322	6	10401	18	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55640	6	10420	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52780	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	52.217.99.126	52.217.99.126	10.1.1.50	10.1.1.50	443	45980	6	8600	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52788	6	6728	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55664	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55668	6	10467	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad
ACCEPT	1690329606	1690329625	10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55662	6	6728	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	904652123456	vpc-1544e6fc7eab628ad



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52.216.215.0	S3
52.217.111.214	S3
52.217.118.120	S3
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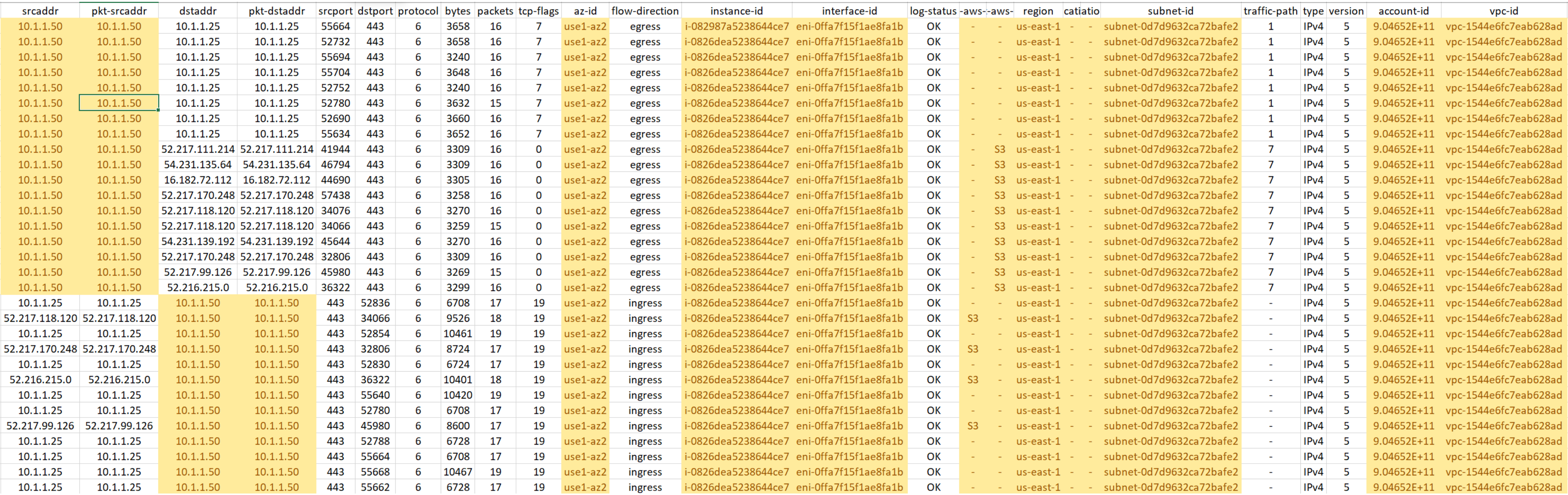
52.217.99.126	S3
54.231.135.64	S3
54.231.139.192	S3

Sorted For Directionality – Internal IP Labeling



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10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55664	443	6	3658	16	7	use1-az2	egress	i-082987a5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52732	443	6	3658	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55694	443	6	3240	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55704	443	6	3648	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52752	443	6	3240	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52780	443	6	3632	15	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	52690	443	6	3660	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	10.1.1.25	10.1.1.25	55634	443	6	3652	16	7	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	1	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	52.217.111.214	52.217.111.214	41944	443	6	3309	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	54.231.135.64	54.231.135.64	46794	443	6	3309	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	16.182.72.112	16.182.72.112	44690	443	6	3305	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	52.217.170.248	52.217.170.248	57438	443	6	3258	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	52.217.118.120	52.217.118.120	34076	443	6	3270	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
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10.1.1.50	10.1.1.50	54.231.139.192	54.231.139.192	45644	443	6	3270	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
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10.1.1.50	10.1.1.50	52.217.99.126	52.217.99.126	45980	443	6	3269	15	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.50	10.1.1.50	52.216.215.0	52.216.215.0	36322	443	6	3299	16	0	use1-az2	egress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	S3	us-east-1	-	-	subnet-0d7d9632ca72bafe2	7	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52836	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
52.217.118.120	52.217.118.120	10.1.1.50	10.1.1.50	443	34066	6	9526	18	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52854	6	10461	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
52.217.170.248	52.217.170.248	10.1.1.50	10.1.1.50	443	32806	6	8724	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
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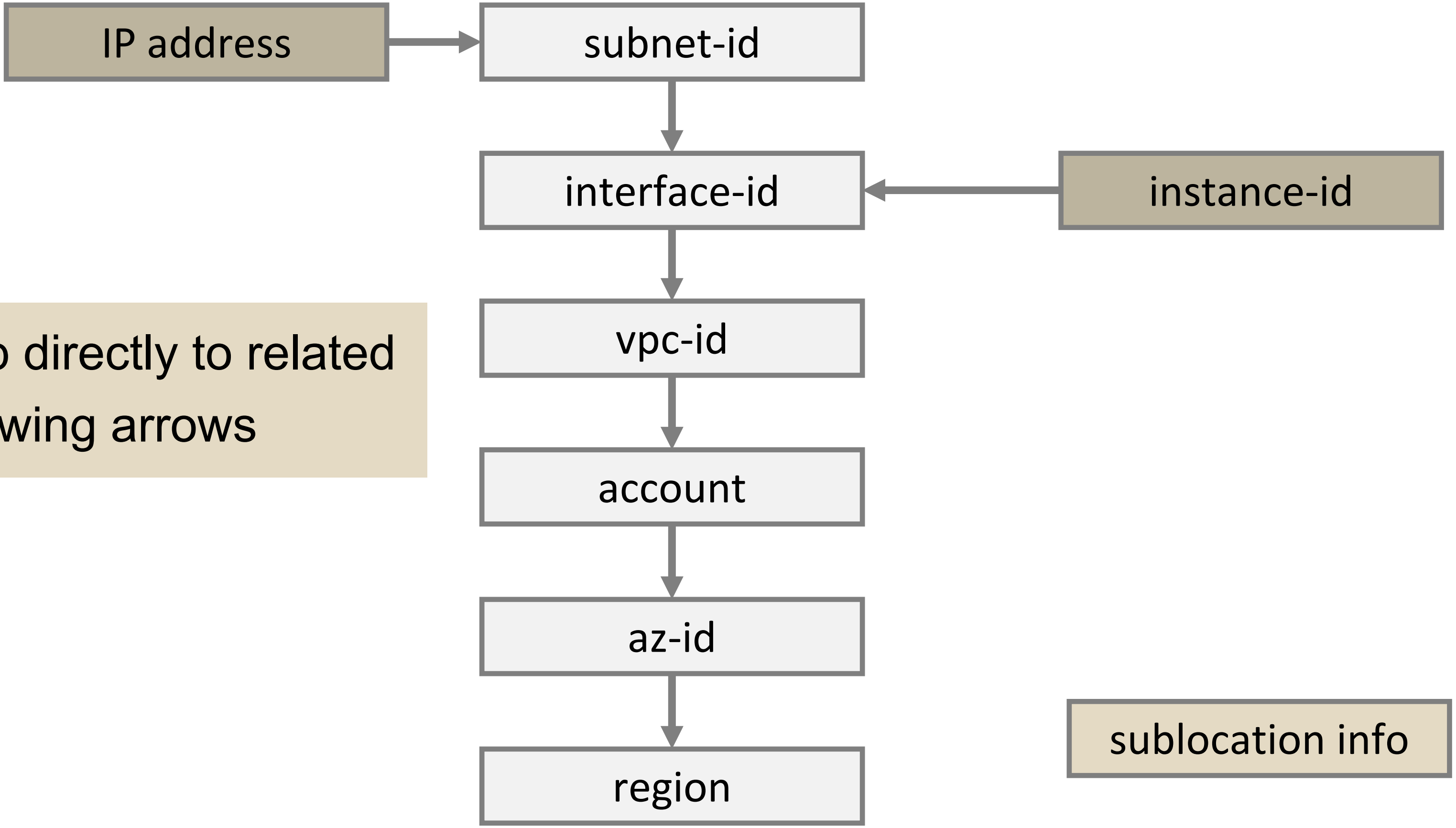
52.216.215.0	52.216.215.0	10.1.1.50	10.1.1.50	443	36322	6	10401	18	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55640	6	10420	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52780	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
52.217.99.126	52.217.99.126	10.1.1.50	10.1.1.50	443	45980	6	8600	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	S3	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	52788	6	6728	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55664	6	6708	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55668	6	10467	19	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad
10.1.1.25	10.1.1.25	10.1.1.50	10.1.1.50	443	55662	6	6728	17	19	use1-az2	ingress	i-0826dea5238644ce7	eni-0ffa7f15f1ae8fa1b	OK	-	-	us-east-1	-	-	subnet-0d7d9632ca72bafe2	-	IPv4	5	9.04652E+11	vpc-1544e6fc7eab628ad

IP Address	First Seen	Last Seen	Availability Zone	Instance-ID	Interface-id	Service	Region	Subnet-ID	Account-ID	VPC-ID	Sublocation
10.1.1.50	1690329000	1690330000	use1-az2	i-0826dea5238644ce7	eni-0ffa7e54f1ae8fa1b		us-east-1	subnet- 0d7d9632ca72bafe2	904652123456	vpc- 0844e5fd7dab616dd	

[DISTRIBUTION STATEMENT A] Approved for public release and unlimited distribution.

Further Cloud Field Reduction



Values map directly to related values following arrows

Fields we can remove or reduce

Action

- accept and reject accounted for in SiLK class/type

Flow-direction

- accounted for in SiLK class/type

Log-status

- used for processing, but not analyzing

Interface-id

- can either become silk sensor

Type

- dropped as SiLK combines v4 and v6

Version

- used for processing, but not analyzing

Convert non-mirrored flows

Convert what doesn’t come out of sensor to that format, such as SiLK, IPFIX, Zeek.

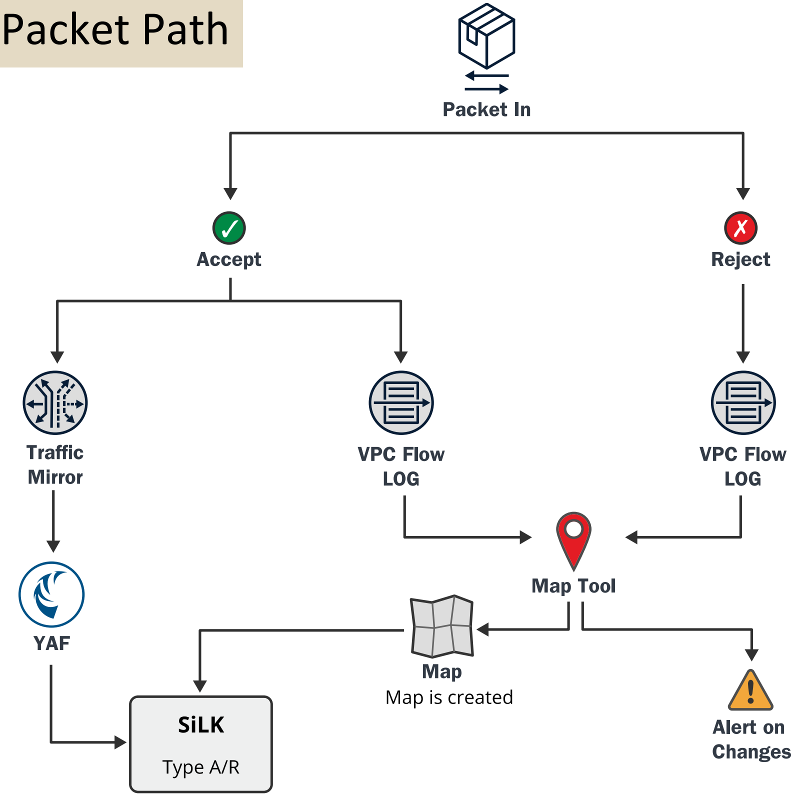
Primarily “REJECT” packets

Choose proper IP addresses from flow logs from a NAT

PKT-SRCADDR and PKT-DSTADDR

Architecture

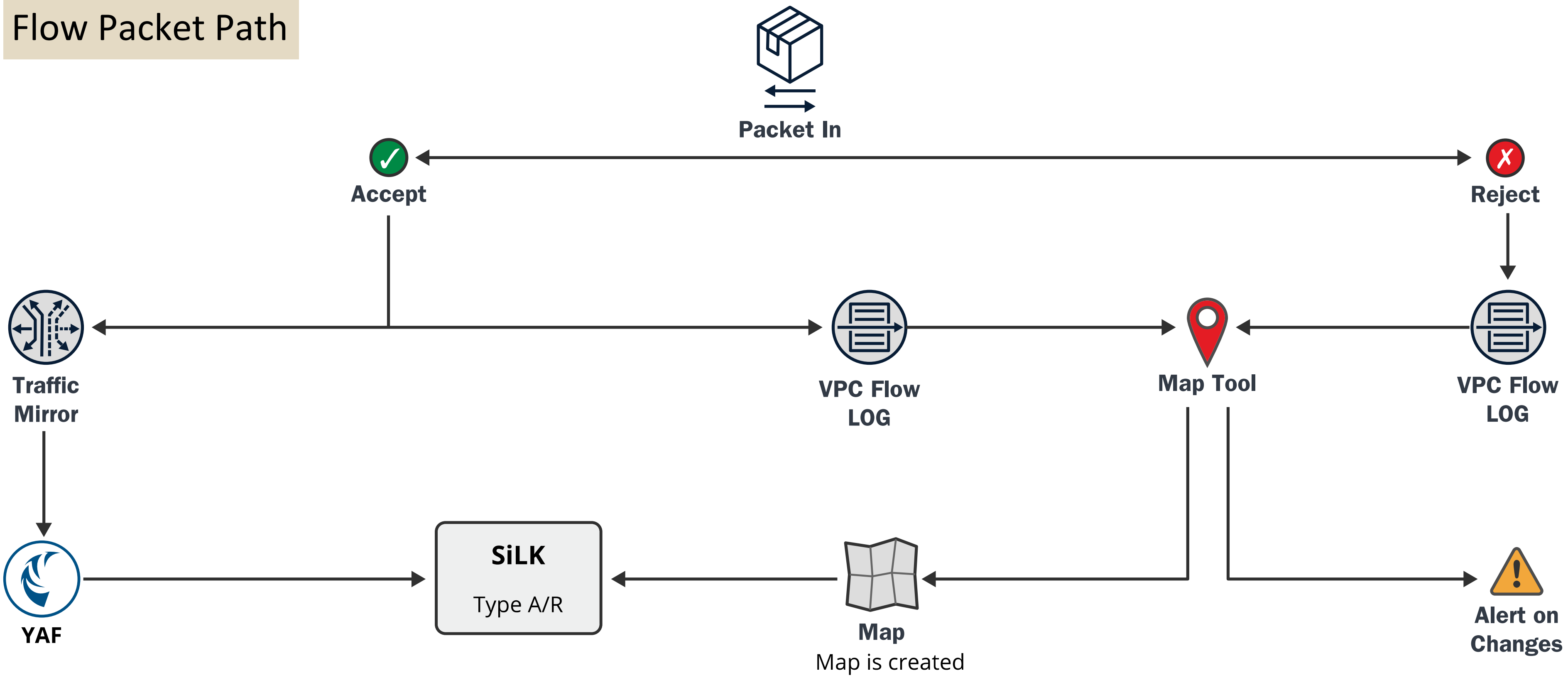
Flow Packet Path



- **Accept** flows in both. Extract for map
- **Reject** flows added to SiLK repository
- Map referenced by SiLK tools.
- Map can also alert on changes

Full Architecture

Flow Packet Path



Next Steps

- How to handle multiple interfaces meaningfully to create an “**inside**” and “**outside**”
- Define additional class-type labels:

  int2aws

  aws2int
- Investigate AWS API calls for context
- Handle multi-VPC collection efficiently
- Additional architectures
- AWS VPC Flow Log to SiLK

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