Splunk can Drink from a Firehose

An AWS Kinesis Firehose

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Forward-Looking Statements

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What's In It For You

Deep Dive into AWS Firehose/Splunk Integration

- High Level Understanding of AWS Firehose
- How it Integrates with Splunk
- How to Get an Initial Service Up and Running
- How to Splunk-ify Your Data
- How to Design for Errors
- How to Cost Estimate the Service

- **All the Tools Necessary to Build Production Ready Services**

Who We Are and How We Got Here

FINRA's Roadmap with Splunk and AWS

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We Are FINRA

Financial Industry Regulatory Authority

- An independent, non-governmental regulator for all securities firms doing business with the public in the United States
- Regulates 630,000 brokers and 3,800 brokerage firms and by monitoring trading on U.S. stock markets
- FINRA monitors up to 100 billion transactions analyzed per day. Take the number of:
  - VISA charges (29M) + tweets (0.5B) + likes and updates (2.7B)
  - Add them together, multiply by 20, and you almost get to 100B

Our Journey with Splunk

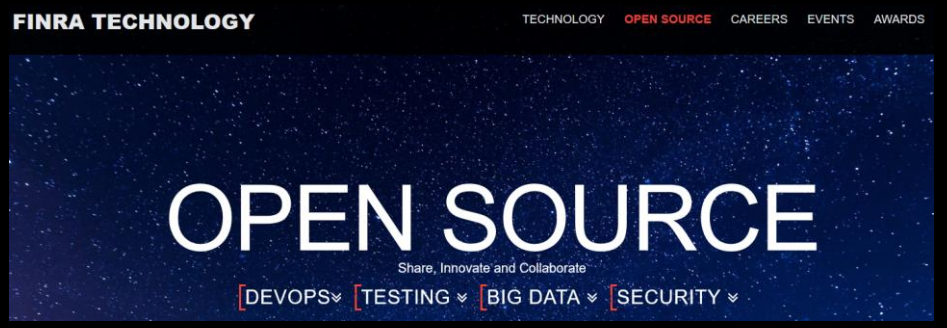
- Became one of the First Large SplunkCloud Customers in 2013
- Over 1/3 of Technology Staff uses Splunk every week
- Became Enterprise Security Customer in 2018
- Key Splunk/AWS Integrations:
  - Orchestrated Splunk into all Elastic Compute IaaS
  - IAM Compliance
  - Bootstrapped Splunk agent into Elastic Map Reduce (EMR)
  - Splunk Side-Car Container Service for ECS
  - Financial System of Record for all AWS charges
  - Security Group Analysis/Maintenance/Alerting
  - Event Driven Surveillance
  - And…..

Shameless Self Promotion

If You Are Here, You Might Enjoy…..

- .conf2017 – Integrating Splunk and AWS Lambda
  - A Better way to Get AWS Cloud Trail Logs into Splunk
  - Open Sourced as “CT Grazer”
  - https://github.com/FINRAOS/CTGrazer

- FINRA is Active in the Open-Source Community
  - DevOps
  - Security
  - Big Data
  - http://technology.finra.org/opensource.html



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What is the AWS Firehose Service

Let's Deconstruct into Sub-Services

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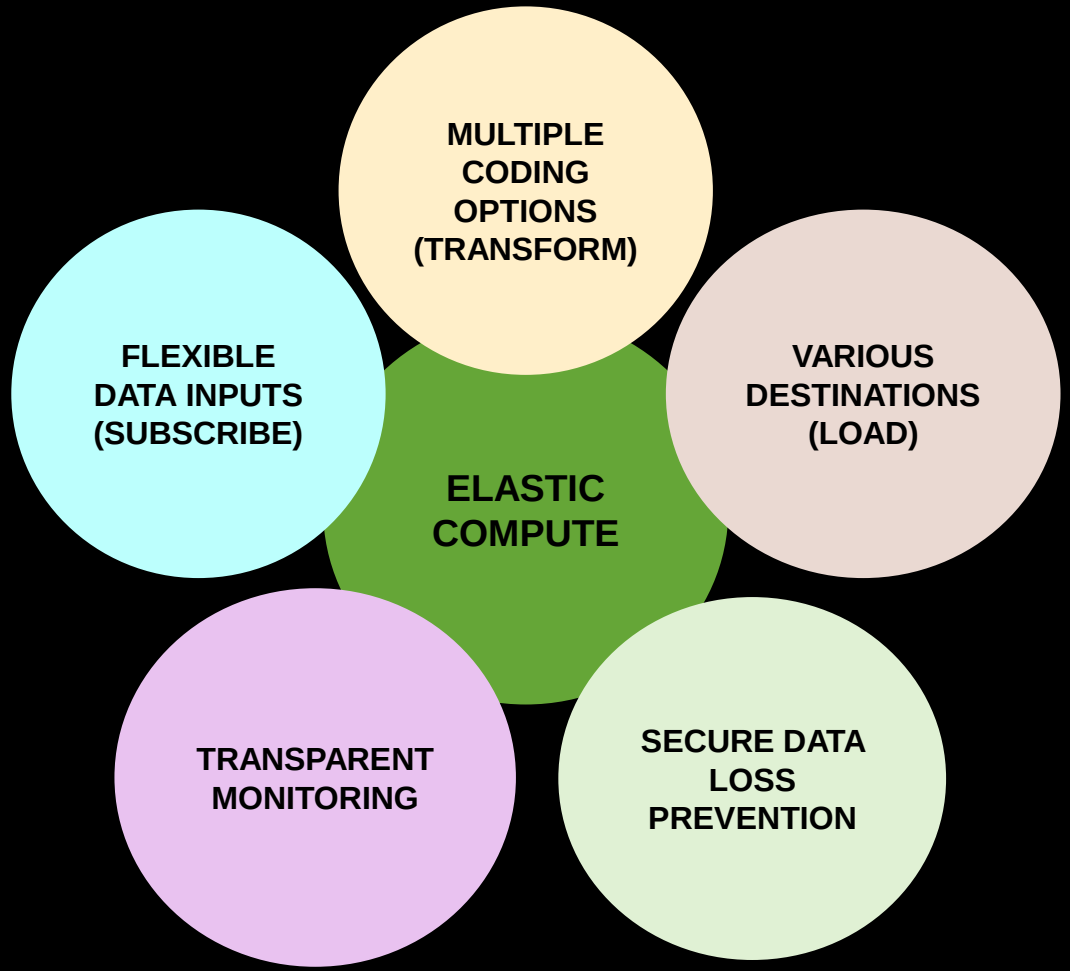
Subscribe/Send – Transform - Load

Financial Industry Regulatory Authority



Configuring Firehose to Send Data to Splunk

Everything You Need to Get Your First Integration Working

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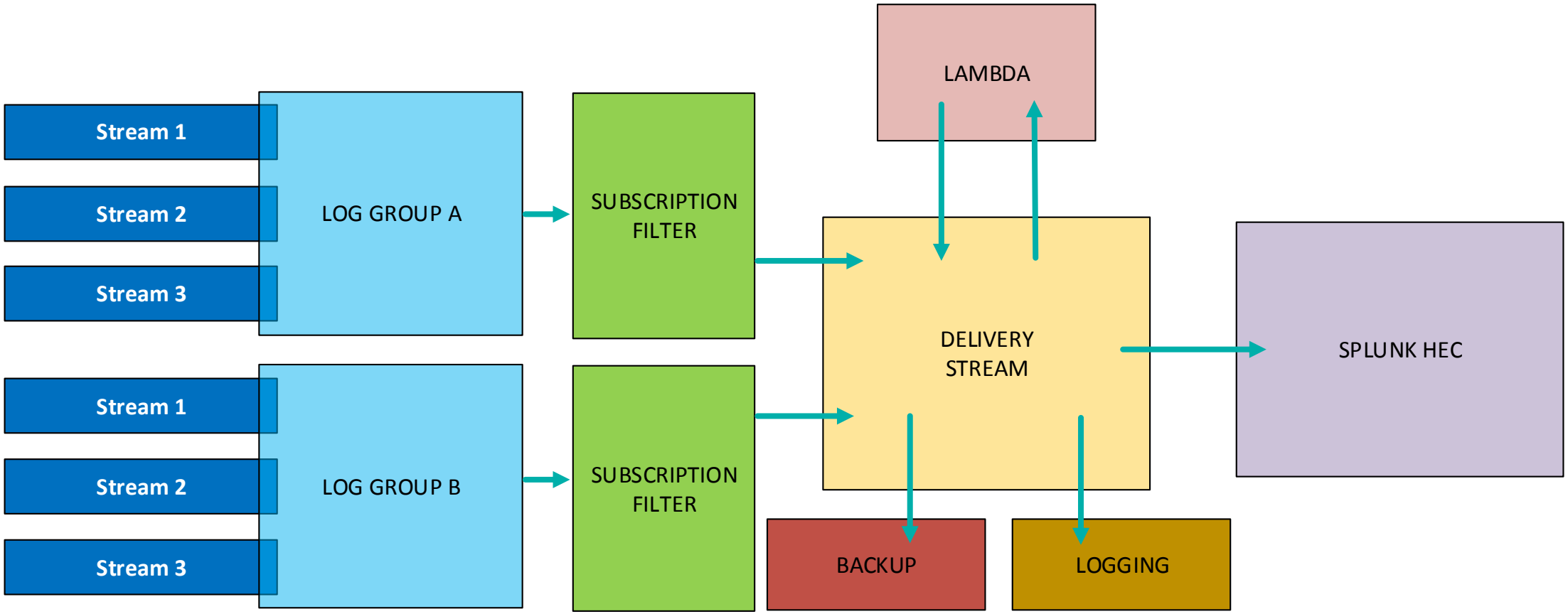
Overview of CWL into Firehose

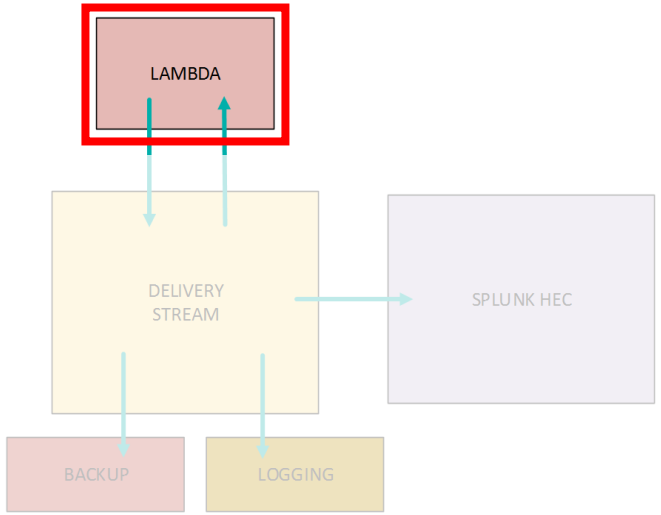


Data Processing

Lambda configuration for Data Transformation

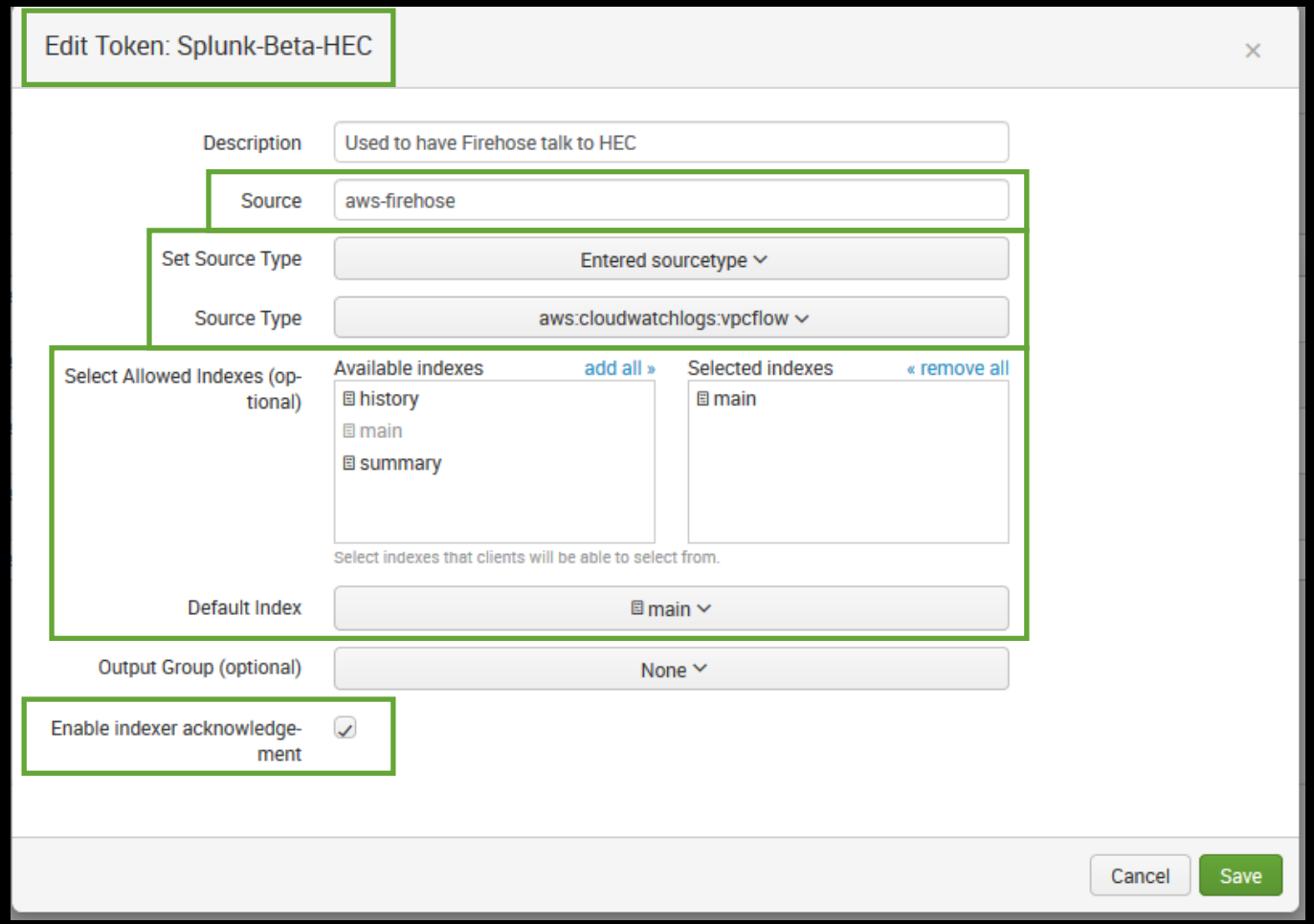
```
"ProcessingConfiguration": {
  "Enabled": true,
  "Processors": [{
    "Type": "Lambda",
    "Parameters": [{
      "ParameterName": "LambdaArn",
      "ParameterValue": "arn:aws:lambda:us-east-1:123456789123:function:SPLUNK-VPC-TRANSFORM:$LATEST“ },
      { "ParameterName": "RoleArn",
        "ParameterValue": "arn:aws:iam::123456789123:role/SVC_FIREHOSE_SPLUNK_SR“ },
      { "ParameterName": "NumberOfRetries", "ParameterValue": "3“ },
      { "ParameterName": "BufferSizeInMBs", "ParameterValue": “1“ },
      { "ParameterName": "BufferIntervalInSeconds", "ParameterValue": "60“ }]
    }]
},
```

- Lambda Function is required for processing CWLs
- FH CWL Blueprints for Lambda
  - Python & Node.js
  - kinesis-firehose-cloudwatch-logs-processor
- IAM Role with access to required resources
- Buffer size



Data Destination Token

Let's look at SPLUNK HEC Token options



- Name of HEC Token
- Source if not defined here
  - http:<tokenName>
- Set sourcetype, ensure
  - "splunk-add-on-for-amazon-kinesis-firehose" installed
  - pulldown_type is enabled
- Index configuration
- Indexer acknowledgement

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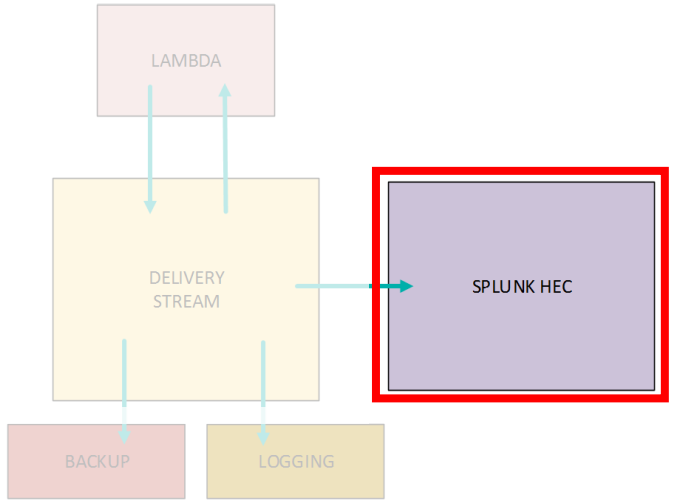
Data Destination

SPLUNK HEC configuration

```
"HECEndpoint": "https://yourhec.your.org:8088",
"HECEndpointType": "Raw",
"HECToken": "2d626201-8bab-45f4-b280-24499c56f1f4",
"HECAcknowledgmentTimeoutInSeconds": 180,
"RetryOptions": {
        "DurationInSeconds": 300
},
```



- Before you begin, ensure:
  - DS and HEC endpoints can communicate
  - Enable sticky session for: proxy/LB
- Endpoint Type
  - Raw
    - All Events Strung Together
    - New Line delimiter
  - Event
    - JSON structured
- CA-signed certificate
- Indexer Acknowledgement timeout

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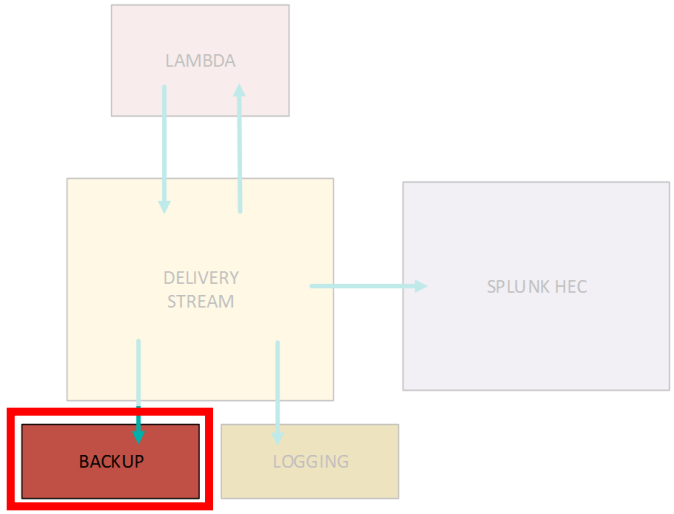
Data Backup

S3 configuration in case of delivery failure

```
"S3BackupMode": "FailedEventsOnly",
"S3Configuration": {
  "RoleARN": "arn:aws:iam::123456789123:role/SVC_FIREHOSE_SPLUNK_SR",
  "BucketARN": "arn:aws:s3:::1234-5678-9123-logs",
  "Prefix": "SPLUNK/firehose",
  "BufferingHints": { "IntervalInSeconds": 300, "SizeInMBs": 5 },
  "CompressionFormat": "UNCOMPRESSED",
  "EncryptionConfiguration": {
    "KMSEncryptionConfig": {
      "AWSKMSKeyARN": "arn:aws:kms:us-east-1:123456789123:key/63852895-684e-47b5-9740-78a1da0a31f0“
} },
```

- Backup Failed Events Only or All Events
- S3 bucket
- IAM Role for writing to S3
- Compress events
  - $$ vs Ease of Processing
- Encryption



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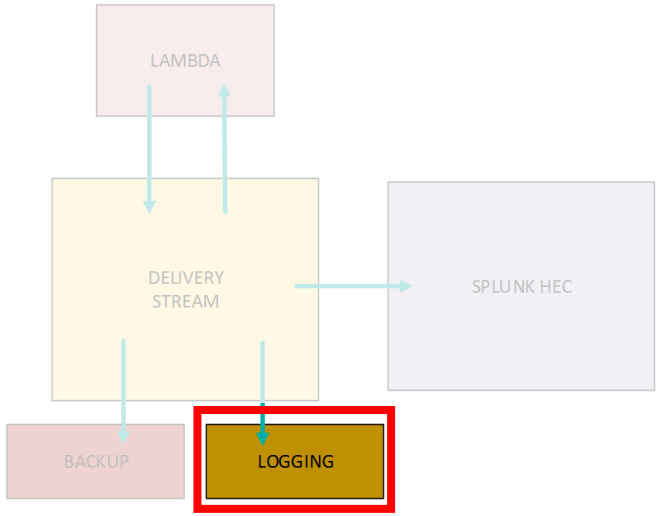
CWL Logging

DS self error logging

```
"CloudWatchLoggingOptions": {
        "Enabled": true,
        "LogGroupName": "/aws/firehose/<LogGroupName>",
        "LogStreamName": "S3Delivery"
        }
},
"CloudWatchLoggingOptions": {
        "Enabled": true,
        "LogGroupName": "/aws/firehose/<LogGroupName>",
        "LogStreamName": "SplunkDelivery"
        }
}
```

- Enable logging for
  - S3 delivery
  - Splunk delivery
- LogStream – a place you write events
- LogGroup – can contain multiple log streams



Delivery Stream Configuration

Configuration via CLI Command & JSON

aws firehose create-delivery-stream

--delivery-stream-name “<NameOfDeliveryStream>”

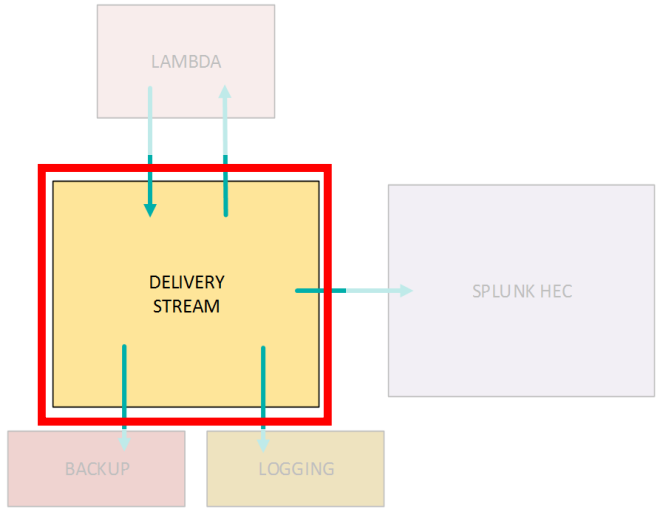
- Name must be unique in AWS region per account

--splunk-destination-configuration file:///<PATH-TO-JSON-FILE>

- JSON Formatted
- All Configuration Settings for Splunk Destination

[--delivery-stream-type “DirectPut”]

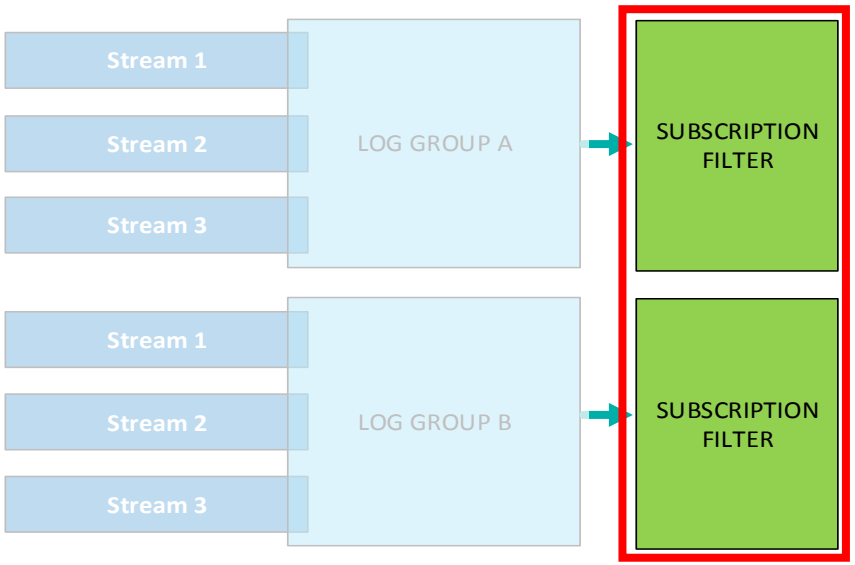
- Type of stream. Default type is “DirectPut”

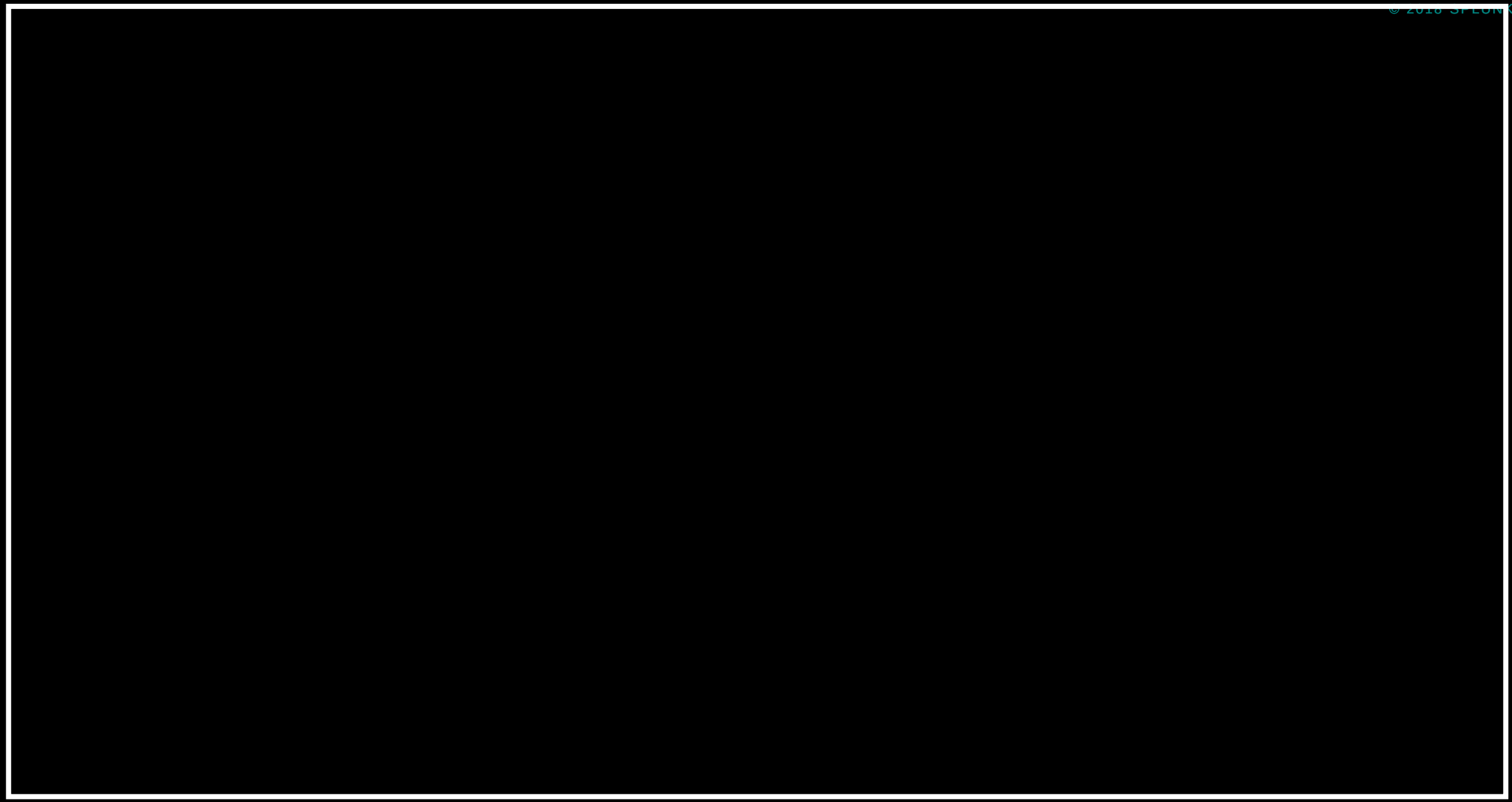


Delivery Stream

Associate subscription filter to log group

- put-subscription-filter
  - --log-group-name <value>
    - Log Group can only have ONE subscription filter
  - --filter-name
    - Unique Name of your subscription filter
  - --filter-pattern
    - Method to filter Streams from a LogGroup
  - --destination-arn
    - The Delivery Stream we just built
  - --role-arn
    - Must be able to read from CloudWatch and write to the Delivery Stream





Digging Deep into the Transform AWS Lambda Function

kinesis-firehose-cloudwatch-logs-processor-python

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Why Would I *EVER* Want To Do This?

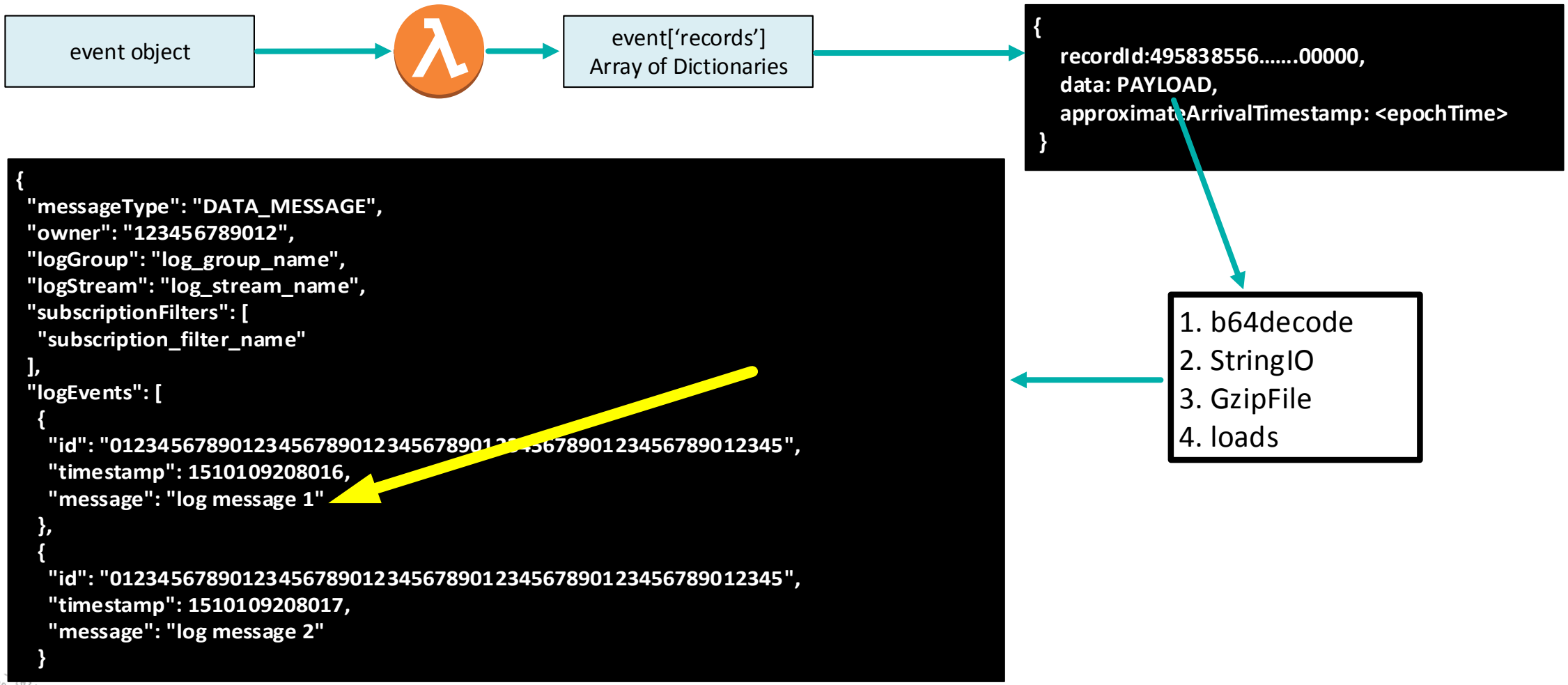
Saving Money & Better User Experience

- Filter Events
- Event Enrichment
  - Send to JSON HEC Key
- Put Your Events on a Diet
- Enhanced Logging
  - Give me more information about what's going on!!!
  - Optimize your configuration settings
- Lambda Efficiencies
  - Small changes are multiplied
- It is *only* a Blueprint

Configure
Customize
Optimize

Getting to the Log Messages

kinesis-firehose-cloudwatch-logs-processor-python



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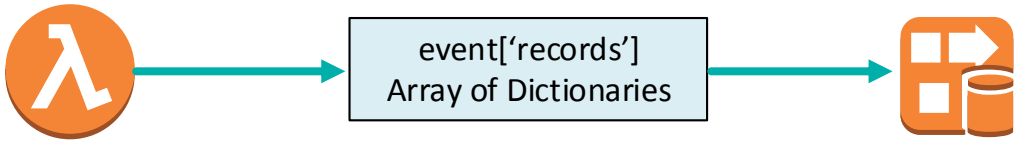
What You Send Back

- data
  - base-64 encoded
  - FORMATTED_PAYLOAD
    - EVENT – new line delimited
    - JSON – Serialized Array of Dictionaries
  - NOT GZIPPED!!!
- result
  - Ok – Send this record's data to the HEC
  - Dropped – All is well, nothing to send to HEC
  - ProcessingFailed – Raises an error in Monitoring
- recordid
  - Accounted for by the Delivery Stream




```
{
  'data': FORMATTED_PAYLOAD,
  'recordId': 495838556.....00000,
  'result': RESULT_VALUE
}
```

Filtering Data

Knowing Your Data Saves $$$

- Omit Chatty, Low Value Events
  - Successful queries to valid service address
    - Lines 1, 3-5, transformLogEvent
- Ensure you test for empty sets
  - Line 7 processRecords
- Efficiency equals cost savings
  - Regex is ~10x slower than ‘IN’
  - Find is ~2x slower than ‘IN’
  - Lines 3-5, transformLogEvent
- This is HEC sourcetype=
  - aws:cloudwatchlogs:vpcflow

```
1 for e in data['logEvents']:
 2         event = transformLogEvent(e)
 3         if(event):
 4             tmpData.append(event)
 5
 6 # if we have no data, mark as dropped
 7     if(tmpData):
 8         data = base64.b64encode(''.join(tmpData))
 9         yield {
10                 'data': data,
11                 'result': 'Ok',
12                 'recordId': recId
13             }
14     else:
15         yield {
16                 'result': 'Dropped',
17                 'recordId': recId
18             }
```

processRecords

```
1if 'NODATA' in log_event['message']:
2         return 0
3 elif(( ' 9997 ' in log_event['message']) and
4       ( ' ACCEPT ' in log_event['message'])):
5         return 0
6 else:
7         return log_event['message'] + '\n'
```

transformLogEvent

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Enriching Data

- Make Life Easy for Your Users
- Only Send Variables through the Delivery Stream, Add Constants in the Config
- Naming Standards?
- Fields must be entered in fields.conf to be searchable as fields
- This is HEC sourcetype=_json
- Remember to remove the newline from the event
- Convert the dictionary to string before sending back

```
eventDict                                = {}
eventDict['time']                        = log_event["timestamp"]
functionName                             = re.split('\/',logGroup)[-1]
if( '-' in functionName ):
   ags                    = re.split('-',functionName,maxsplit=1)[0]
else:
   ags                    = 'UNK'
eventDict['sourcetype']                            = ags.lower()
eventDict['source']                                = 'aws:lambda'
eventDict['fields']                                = {}
eventDict['fields']['region']                      = region.lower()
eventDict['fields']['account']                     = account
eventDict['fields']['logGroup']                    = logGroup
eventDict['fields']['logStream']                   = logStream
eventDict['fields']['functionName']                = functionName
eventDict['fields']['subscriptionFilter'] = subscriptionFilter

eventDict.update({ "event" : log_event['message'].rstrip('\n')})

return json.dumps(eventDict)
```

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Understanding ReIngestion

Dealing with Extremely High Volume CloudWatch Streams

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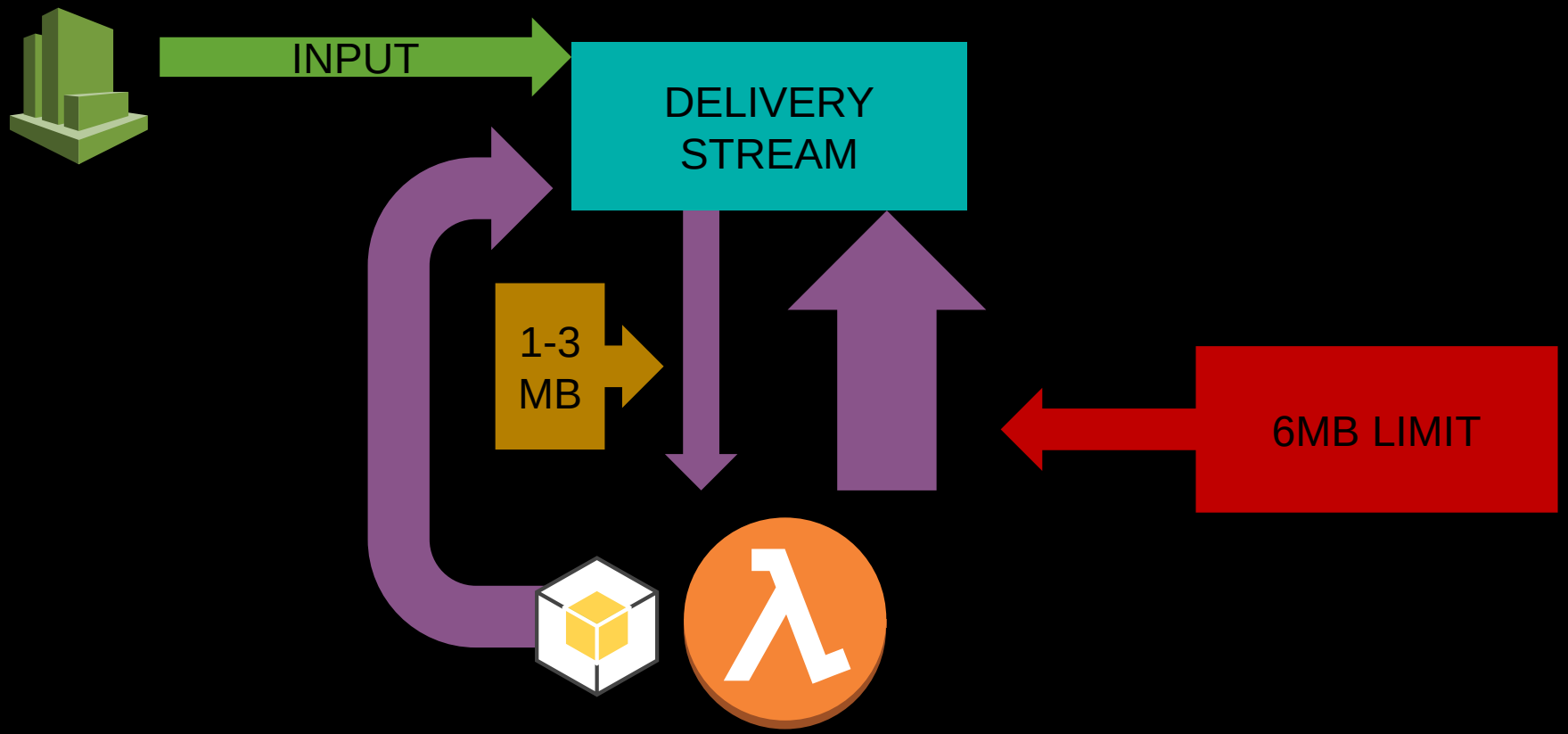
What Is Re-Ingestion

And Why Do We Need to Care



Blueprint Performance Tweak

All Records are NOT Created Equal

```
if( projectedSize + len(rec['data']) + len(rec['recordId']) < 6000000 ):
        projectedSize += len(rec['data']) + len(rec['recordId'])
```

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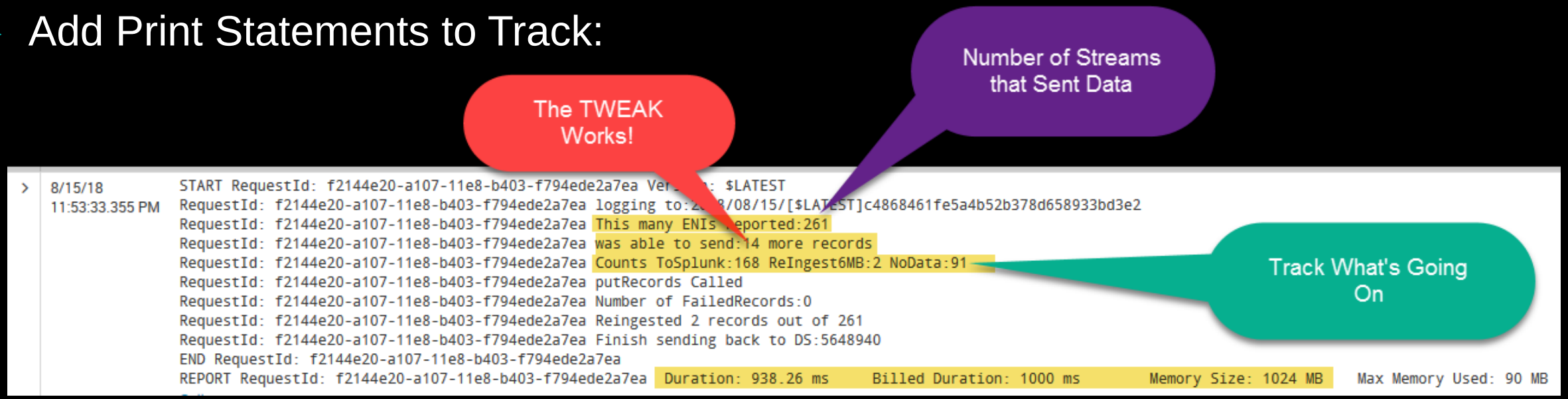
Things You Need to Know

- AWS CLI calls put_record() & put_record_batch() are Relatively Expensive
- Some Re-Ingestion Normal, BUT Excessive Re-Ingestion can Drive Lambda Charges and Cause Latency
- Add Print Statements to Track:



- Adjust Your AWS design accordingly
  - Two Delivery Streams can be less expensive than One

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Planning for Errors

Automating for Bad Times

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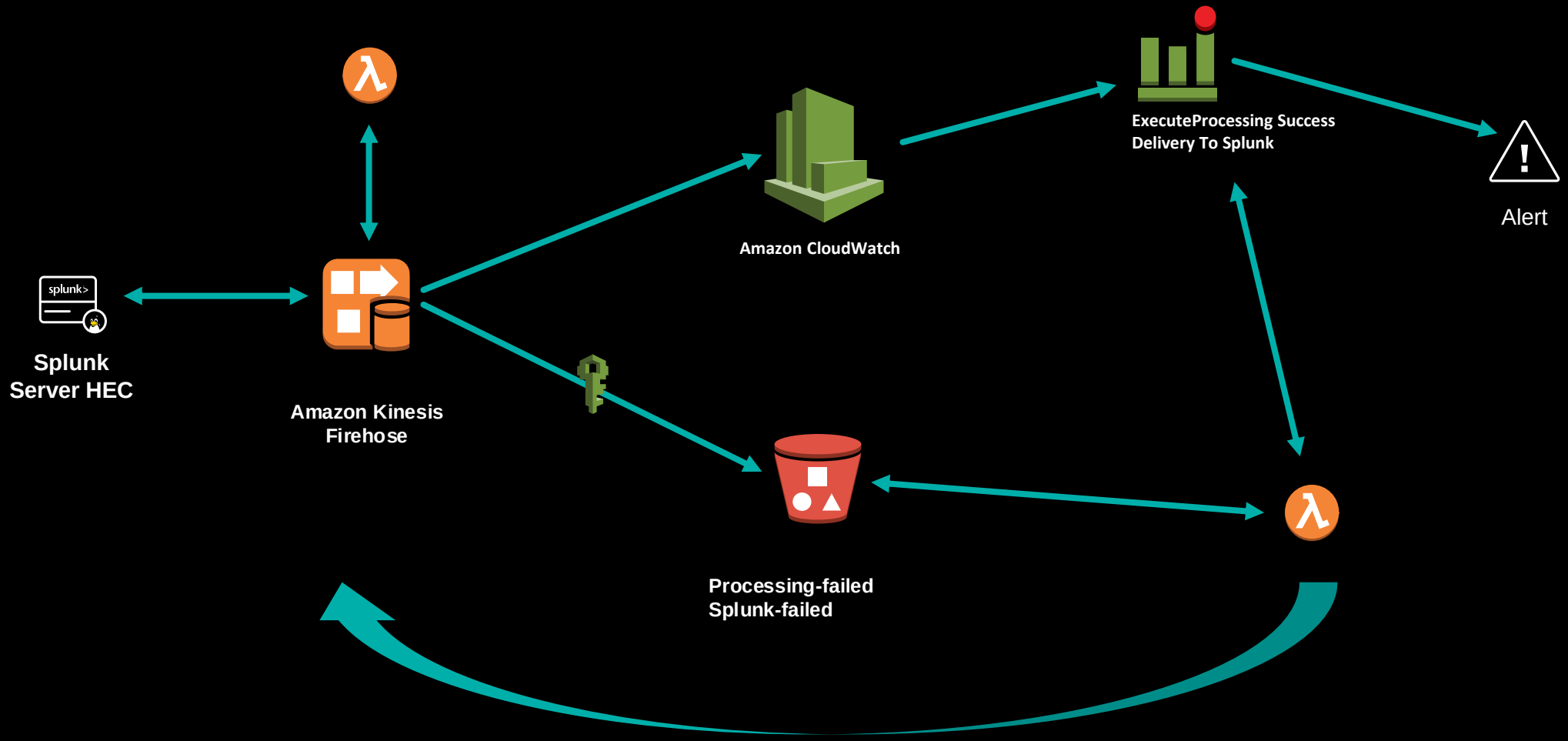
Error Types

Know Your Enemy (Sun Tzu)

- Transient
  - Delete/Add lag for Lambda function (use aliases)
  - Delivery Stream had some difficulty (extremely rare occurrence)
  - Service is HEALTHY
- Persistent
  - New version of Lambda has logical errors (Processing Error)
  - HEC Key was removed (Splunk Error)
  - SG was incorrectly updated (Splunk Error)
  - Service is NOT HEALTHY
- Both Are Sent to the Configured S3 Bucket



When DS State is Healthy

Pricing Out the Costs of a Solution

“Always the Dollars…” Joe Pesci, Casino

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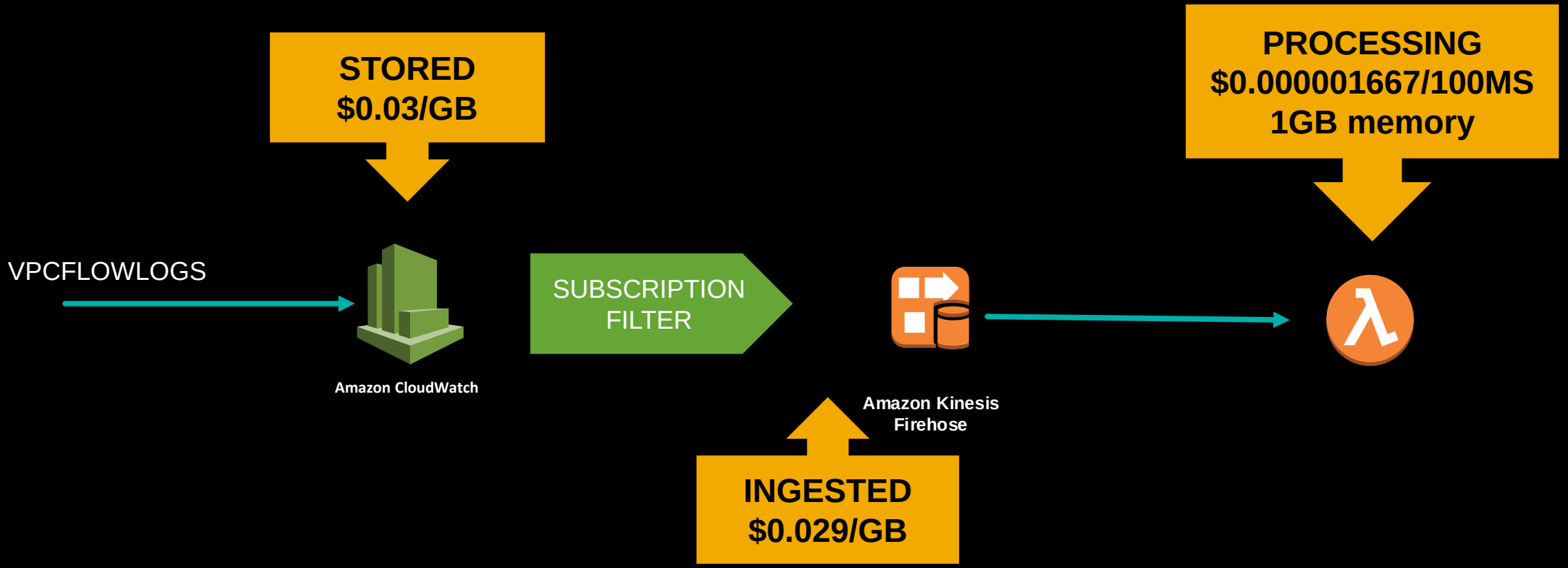

Let's Do the Math

100 GB of VPCFLOWLOGS into Splunk per Day

- Processing
  - $50K \frac{runs}{day} x \frac{365\ day}{year} x \frac{900ms}{run} x \frac{\$0.000001667}{100ms}$ = $274/year
- Ingested

50% Compression Rate

Filtering 20% of Events

100GB to Splunk>

  - $42 \frac{GB}{Day}\ X \frac{\$0.029}{GB}\ X\ 365 \frac{Days}{Year}$ = $445/year
- Stored (savings)
  - $42 \frac{GB}{Day} X \frac{\$0.03}{GB}\ X\ 365 \frac{Days}{Year} X \frac{11}{12}$ = $422
- Total
  - $\$445 + \$274\ - \$422 = \$297$ + error processing

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Putting it All Together

What is a Conductor with No Orchestra?

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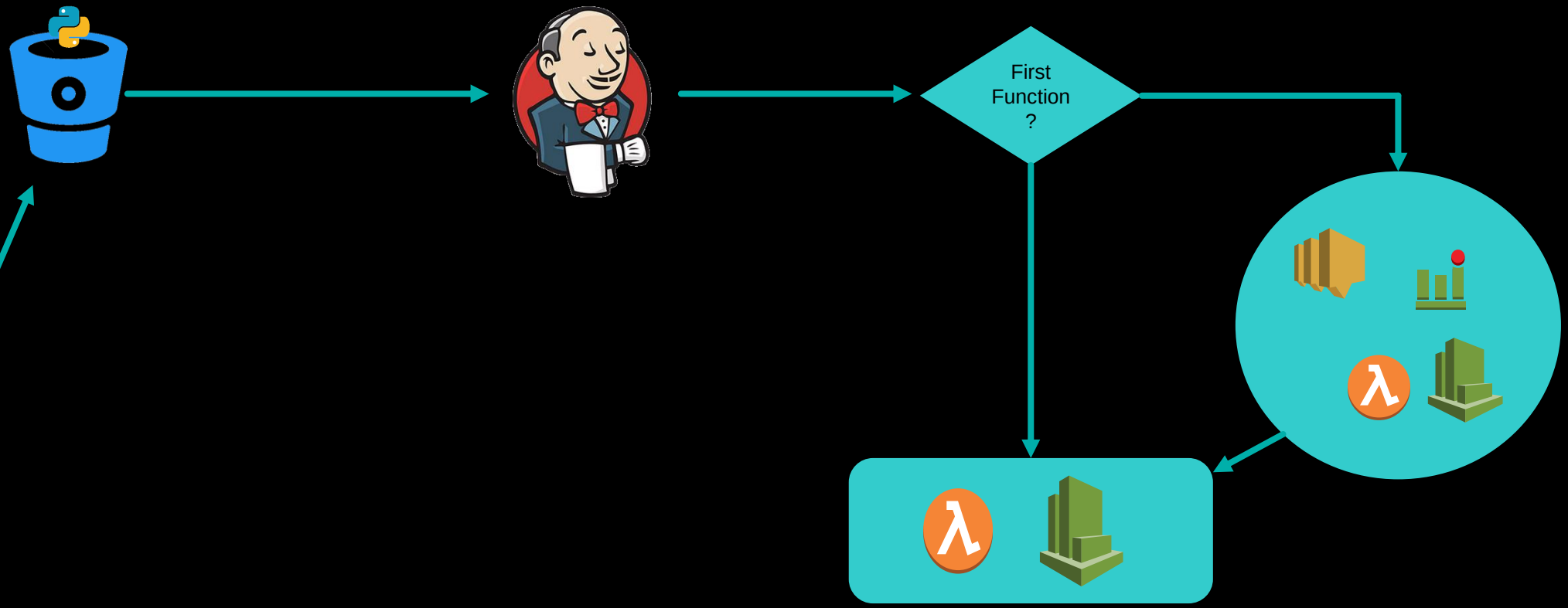

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3 Key Takeaways

Because there is *always* three

1. Using AWS Firehose with a Splunk Destination is a Flexible, Cost-Effective, Fast, and Reliable method to ingest AWS logs

2. Take the time to Design a Robust, Reusable, and Hands-Free Eco-System

3. Let Splunk and AWS do what they do best individually, will provide greater ROI and User Acceptance

Thank You

Don't forget to rate this session in the .conf18 mobile app