Logging best practices on AWS: from an ELK to an EKK stack.

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Amazon Elasticsearch Service | *Amazon S3* | *Kibana* | *Logging* | *Logstash*

Introduction

Nowadays it is increasingly important to be able to monitor and track the status of your applications, as well as being able to easily identify the source of problems. Counting the ever increasing number of digital services, regardless of their size and importance, this need is increasingly felt.

For some time we are also working with many modern and complex infrastructural patterns, such as microservices and serverless. Effective and centralized tools for monitoring must be found.

Far be it from me to describe and compare the various logging management programs, a single article would not be enough! We can say, however, that in the AWS world these problems are significantly reduced thanks to the numerous alternatives we have available, together with the advantage of fully managed services!

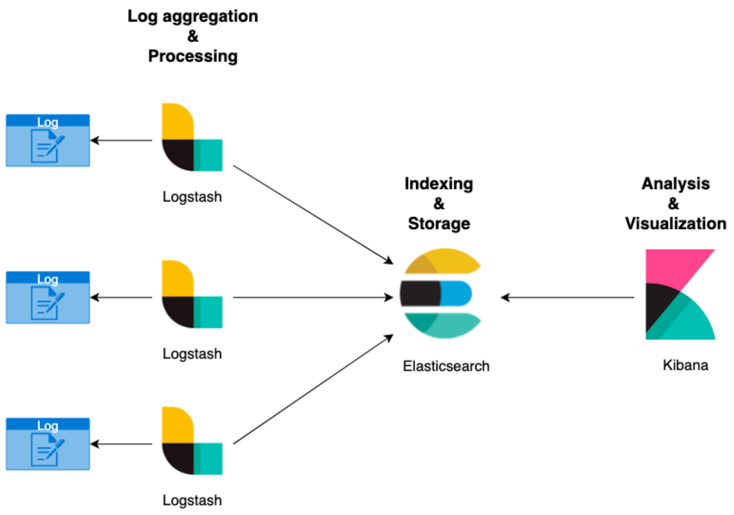
In this article we will talk about how to centralize and efficiently manage logs from various applications, remaining entirely on the AWS world! Specifically, we will explore an alternative to the popular log aggregation solution, the ELK stack (Elasticsearch, Logstash, Kibana), or the EKK stack (Amazon Elasticsearch Service, Amazon Kinesis and Kibana).

The EKK stack

Let's start with a brief description of the ELK stack. For those of you who know it, let's review together! As in history, also in information technology it is useful to know the past to better understand the present.

Starting from the diagram below, the ELK stack is composed of the following components:

- **Logstash**: Tool for aggregation, processing and forwarding of logs from a *source* system to an Elasticsearch server. This component also takes care of functions such as retry, batching and encryption of logs before being sent to the server.
- **Elasticsearch**: It is a search server, based on Lucene, which is designed to receive logs to save them under *indexes*. Particular attention is to be paid during the setup phase to ensure high availability, in addition to the appropriate choice of indices. These issues will not be covered in this blog.
- **Kibana**: Graphical interface for querying Elasticsearch. It does the "dirty work" of querying the server via API and graphically presenting logs with dashboard and search filters by content and date.



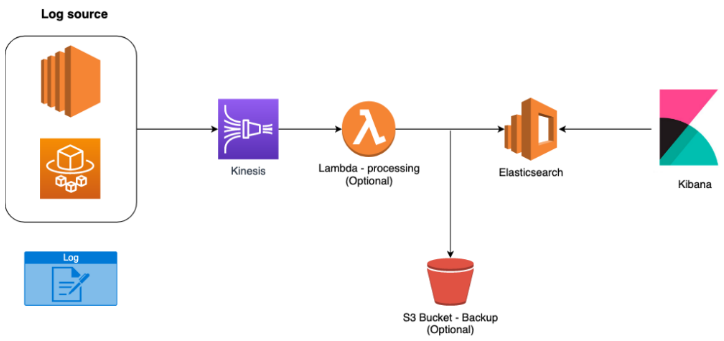
Presented in this way, the simple "logging" management of our application could be relatively complex. However, this stack is used extensively today due to its versatility and scalability.

But we are not going to talk about this structure, indeed we'll describe its cloud-native “fork” on the AWS world! In fact, we will deal with the EKK stack, the components that come into play become:

- **Amazon Elaticsearch service**: the AWS service that supports an open source version of Elasticsearch (Open Distro for Elasticsearch)
- **Amazon Kinesis Firehose**: A reliable, robust, near real-time streaming service used for scenarios such as data lakes or capturing video, audio, and clickstream

- **Kibana**

The infrastructure diagram transforms as follows:



Convenient isn't it? Forget the provisioning and management of EC2 machines, as well as their scaling, maintenance and configuration in high availability. These services, fully managed by AWS, come to our rescue by allowing us to focus on our application and reduce costly activities, in terms of time, for the "trivial" infrastructure linked to the aggregation and presentation of logs.

For the more suspicious, having to send data to Firehose may not be the best choice. So, let's describe the advantages of the proposed solution.

First, there is a native integration between Kinesis and Elasticsearch managed by AWS! Furthermore, we can decide to carry out processing activities on all incoming data, indeed, by using AWS Lambda, we can format the incoming logs from all source systems.

It is not enough? On Kinesis we can also select an S3 bucket to save logs, so they will be available in the future for any analysis or replication to other platforms.

To reduce costs, nothing prevents us from moving data to a different S3 Tier cheaper than the Standard one.

Among the functions offered by Kinesis, there is also that of batching, encryption and retry mechanism to better manage requests to the Elasticsearch server.

But which sources can we use with Kinesis? Ideally, any! In fact, it is possible to directly call the APIs (for example, those provided by SDKs), or we can use tools already provided by AWS if we are using its best-known computing services.

Let's take some examples:

- **EC2**: Thanks to *Amazon Kinesis Agent*, a Java-based software that collects and sends logs independently to Kinesis
- **ECS Fargate**: Integration with Kinesis can be done via the *FireLens* log driver
- **Other service:** By calling the Kinesis API directly.

In summary, we have seen how to bring the classic ELK stack back into an AWS cloud-native perspective, then transforming it into an EKK stack to take advantage of the benefits of AWS managed services.

Can't wait to do some practice? Perfect! Let's do a short demo using an ECS cluster in Fargate mode!

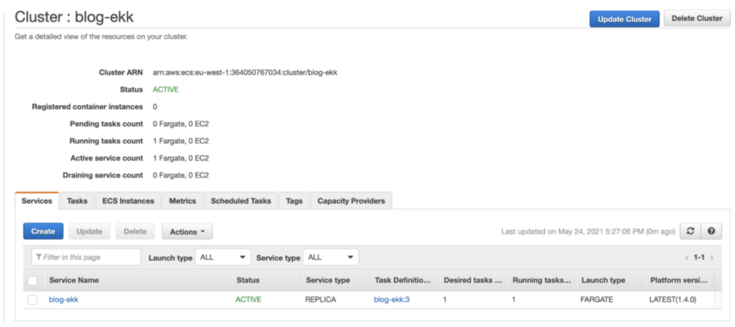
EKK on ECS Fargate

Before starting with the demo, let's describe the services we are going to use:

- **ECS Cluster Fargate**: We have already seen extensively in this blog how to create it and configure any services and tasks.
- **Elasticsearch domain:** We will not cover the details of its configuration. The advice I can give you is to pay attention to the following points:
  - Sizing of the computational stack, tuning high availability, sizing of the appropriate storage you need
  - Manage access patterns to Elasticsearch server (similar to resource-policy)
  - Manage access to Kibana appropriately, in our case we used a Cognito User Pool together with Cognito Identity Pool
  - Network configuration: This part will no longer be editable after creation. In our case, we chose an instance with public internet access.

- **Kinesis Firehose**: As per the infrastructure diagram, the AWS service will be used for data ingestion.

Here is our Fargate cluster with the *service* created for the demo, *blog-ekk*:


Cluster : blog-ekk

Get a detailed view of the resources on your cluster.

Cluster ARN	arn:aws:ecs:eu-west-1:364050767034:cluster/blog-ekk
Status	ACTIVE
Registered container instances	0
Pending tasks count	0 Fargate, 0 EC2
Running tasks count	1 Fargate, 0 EC2
Active service count	1 Fargate, 0 EC2
Draining service count	0 Fargate, 0 EC2

Last updated on May 24, 2021 5:27:06 PM (0m ago)

Launch type ALL Service type ALL 1-1

Service Name	Status	Service type	Task Definitio...	Desired tasks ...	Running tasks...	Launch type	Platform versi...
blog-ekk	ACTIVE	REPLICA	blog-ekk:3	1	1	FARGATE	LATEST(1.4.0)

Particular attention is to be paid in the definition of the *task definition*, we will in fact use *FireLens* for the native integration between Fargate and Firehose:

FireLens is a log driver for containers hosted on Amazon ECS that extends its log management capabilities. It relies on FleuntD and Fluent Bit.

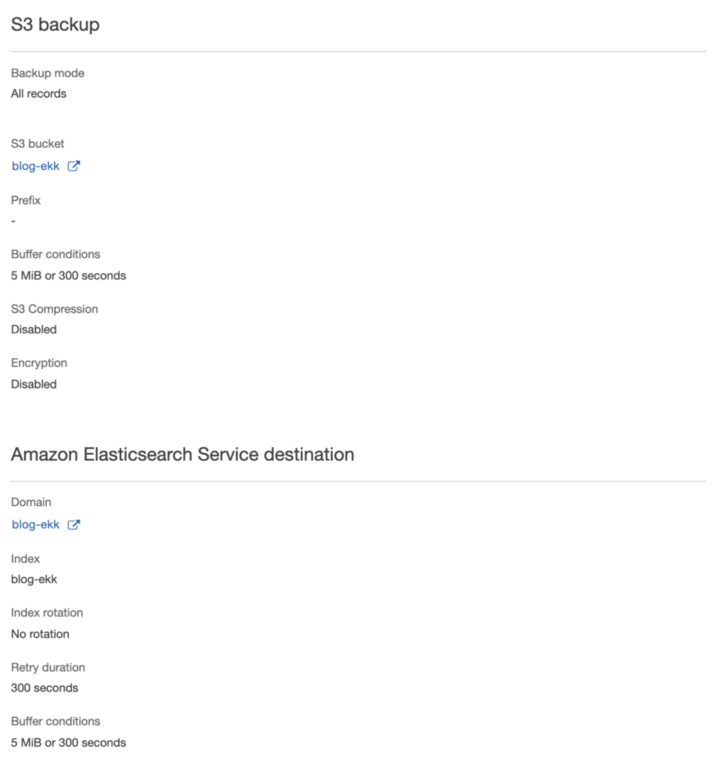
Below is a simplification of the task definition used by us:

{ "family": "firelens-example-firehose", "taskRoleArn": "arn:aws:iam::XXXXXXXXXXXX:role/ecs_task_iam_role", "executionRoleArn": "arn:aws:iam::XXXXXXXXXXXX:role/ecs_task_execution_role", "containerDefinitions": [{ "essential": true, "image": "amazon/aws-for-fluent-bit:latest", "name": "log_router", "firelensConfiguration": { "type": "fluentbit" }, "logConfiguration": { "logDriver": "awslogs", "options": { "awslogs-group": "firelens-container", "awslogs-region": "eu-west-1", "awslogs-create-group": "true", "awslogs-stream-prefix": "firelens" } }, "memoryReservation": 50 }, { "essential": true, "image": "your-image-uri", "name": "app", "logConfiguration": { "logDriver":"awsfirelens", "options": { "Name": "firehose", "region": "eu-west-1"", "delivery_stream": "blog-ekk" } }, "memoryReservation": 100 }]}
If you use the graphical interface to create the task definition, once the container is configured, by modifying the log router in firelens, the side container that relies on FluentBit will automatically appear (container image: *amazon / aws-for-fluent -bit: latest*)

Don't forget to change the task definition role to have permission to write to Firehose!

Perfect, the sender system has been configured! Let's now move to the definition of the ingestion system: Kinesis Firehose!

Its configuration is relatively simple. In our case we used S3 as a backup, Elasticsearch as destination and no Lambda transforms.


S3 backup

Backup mode
All records

S3 bucket
blog-ekk

Prefix
-

Buffer conditions
5 MiB or 300 seconds

S3 Compression
Disabled

Encryption
Disabled

Amazon Elasticsearch Service destination

Domain
blog-ekk

Index
blog-ekk

Index rotation
No rotation

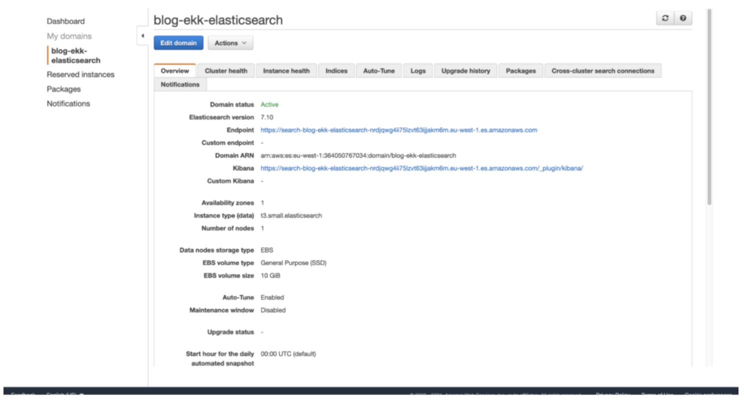
Retry duration
300 seconds

Buffer conditions
5 MiB or 300 seconds

Have you configured everything? Make sure your ECS Service is up and running, in the *log* section you can check that the side container is actually forwarding the logs to Kinesis.

For further verification, you can check from the metrics on Kinesis for correct reception and forwarding to the Elasticsearch server.

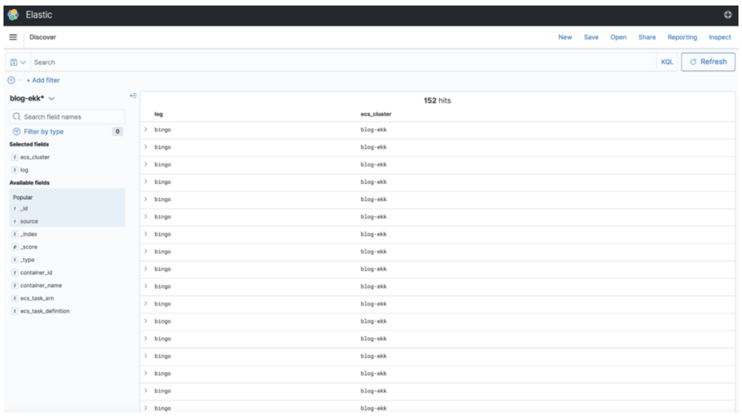
We just have to enter the Elasticsearch domain, on the overview page we will find the address to access Kibana. In our case, access will be authenticated using a username and password saved and managed by Cognito:



blog-ekk-elasticsearch

Domain status	Active
Elasticsearch version	7.10
Endpoint	https://search-blog-ekk-elasticsearch-nrdjqwg4ii75lzvt63ijjakm6m.eu-west-1.es.amazonaws.com
Custom endpoint	-
Domain ARN	arn:aws:es:eu-west-1:364050767034:domain/blog-ekk-elasticsearch
Kibana	https://search-blog-ekk-elasticsearch-nrdjqwg4ii75lzvt63ijjakm6m.eu-west-1.es.amazonaws.com/_plugin/kibana/
Custom Kibana	-
Availability zones	1
Instance type (data)	t3.small.elasticsearch
Number of nodes	1
Data nodes storage type	EBS
EBS volume type	General Purpose (SSD)
EBS volume size	10 GiB
Auto-Tune	Enabled
Maintenance window	Disabled
Upgrade status	-
Start hour for the daily automated snapshot	00:00 UTC (default)

And here is our dashboard on Kibana:



152 hits

log	ecs_cluster
bingo	blog-ekk
bingo	blog-ekk
bingo	blog-ekk
bingo	blog-ekk
bingo	blog-ekk
bingo	blog-ekk
bingo	blog-ekk
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bingo	blog-ekk

The behavior is as expected, we have in fact created a simple container that writes "bingo"

Conclusions

To conclude, in this article we have described the benefits of the EKK stack, an AWS cloud-native version of the classic ELK stack.

We then saw which AWS services can be used as source system, deepening the case of containers hosted on ECS in Fargate mode.

Do you want to deepen this modality with a step-by-step guide? Or maybe you are curious about the solution starting from EC2 machines? Write us in the comments, and we will try to accommodate your requests!

Alessandro Bertini

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