Projet INF728

Recueil et requêtage sur des données de GDELT

Introduction

Techno choisie: MongoDB

Avantages :

- Bonne flexibilité sur les requêtes une fois les documents insérés
- Alternative à Cassandra

Inconvénients :

- Sharding lourd à mettre en place
- Gourmand en mémoire (répétition des articles)
- Requêtes moins efficaces sur les embedded documents

Code: https://github.com/jbSarda/INF728

Sommaire

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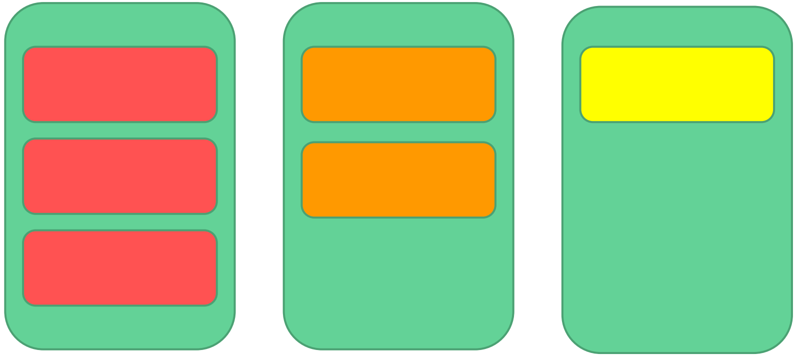
III. Conception et visualisation des requêtes

I. Structures matérielle et logicielle

Nomenclature

Replica-set Ensemble de machines qui contiennent toutes exactement les mêmes données

Shard Portion de l'ensemble des données stockées sur un réplica-set donné (et uniquement sur celui-ci)



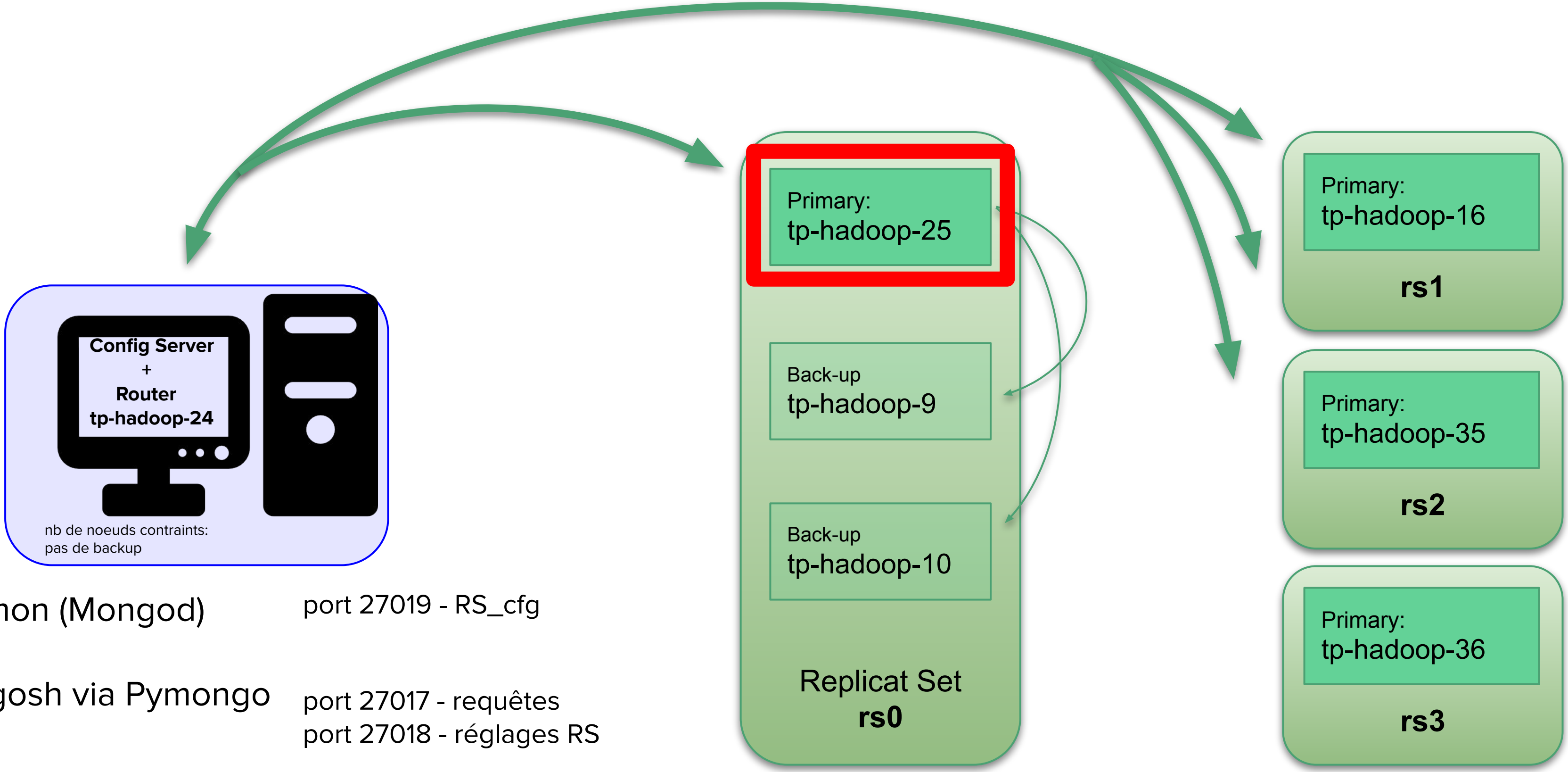
rs0 / shard0
réplication : x2

rs1 / shard1
réplication : x1

rs2 / shard2
pas de réplication

En pratique, au cours de cette présentation, les deux termes sont utilisés comme synonymes pour désigner les blocs de notre architecture

I. Structure matérielle et logicielle



Config Server
+
Router
tp-hadoop-24

nb de noeuds contraints:
pas de backup

Primary:
tp-hadoop-25

Back-up
tp-hadoop-9

Back-up
tp-hadoop-10

Replicat Set
rs0

Primary:
tp-hadoop-16

rs1

Primary:
tp-hadoop-35

rs2

Primary:
tp-hadoop-36

rs3

Daemon (Mongod) port 27019 - RS_cfg

Mongosh via Pymongo port 27017 - requêtes
port 27018 - réglages RS

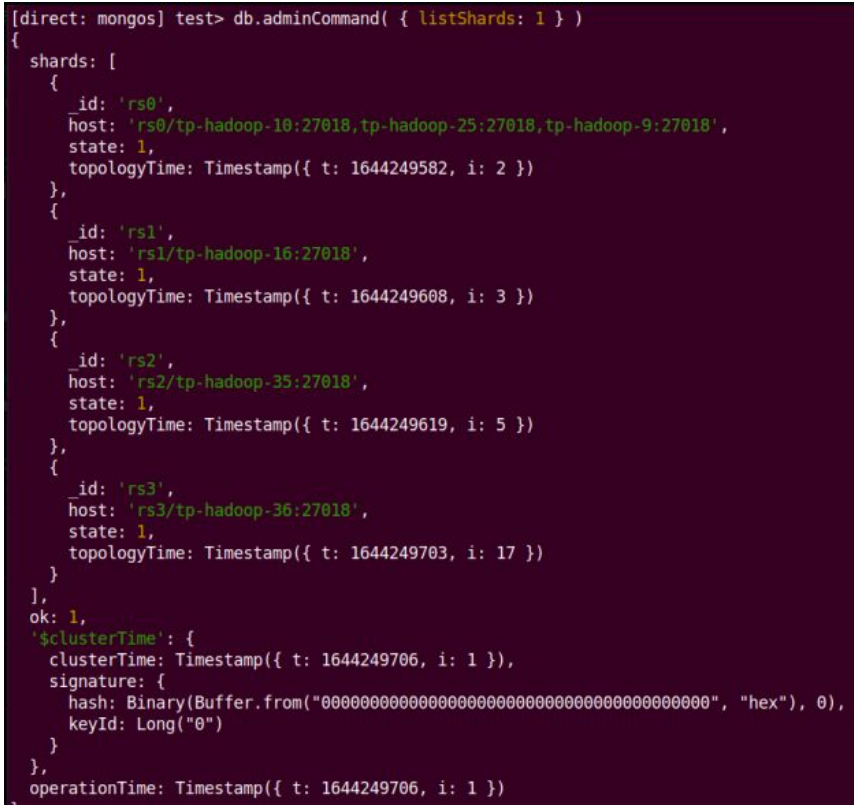
I. Structure matérielle et logicielle

Récapitulatif

➜ 1 config server : “annuaire” de la base

➜ 1 routeur : “mongos”

➜ 4 shards dont seulement 1 répliqué (rs0)

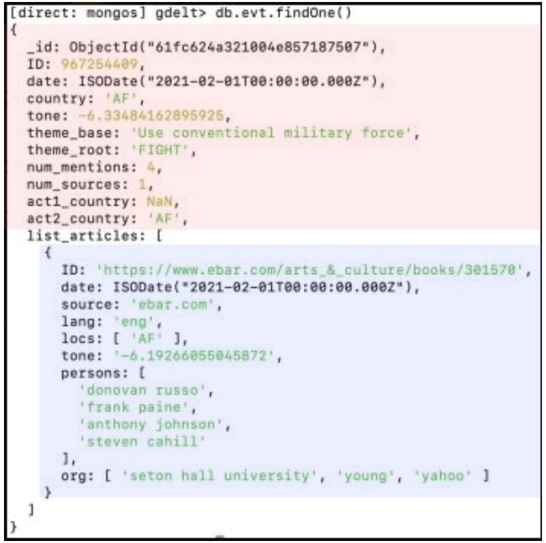


```
[direct: mongos] test> db.adminCommand( { listShards: 1 } )
{
  shards: [
    {
      _id: 'rs0',
      host: 'rs0/tp-hadoop-10:27018,tp-hadoop-25:27018,tp-hadoop-9:27018',
      state: 1,
      topologyTime: Timestamp({ t: 1644249582, i: 2 })
    },
    {
      _id: 'rs1',
      host: 'rs1/tp-hadoop-16:27018',
      state: 1,
      topologyTime: Timestamp({ t: 1644249608, i: 3 })
    },
    {
      _id: 'rs2',
      host: 'rs2/tp-hadoop-35:27018',
      state: 1,
      topologyTime: Timestamp({ t: 1644249619, i: 5 })
    },
    {
      _id: 'rs3',
      host: 'rs3/tp-hadoop-36:27018',
      state: 1,
      topologyTime: Timestamp({ t: 1644249703, i: 17 })
    }
  ],
  ok: 1,
  '$clusterTime': {
    clusterTime: Timestamp({ t: 1644249706, i: 1 }),
    signature: {
      hash: Binary(Buffer.from("0000000000000000000000000000000000000000", "hex"), 0),
      keyId: Long("0")
    }
  },
  operationTime: Timestamp({ t: 1644249706, i: 1 })
```

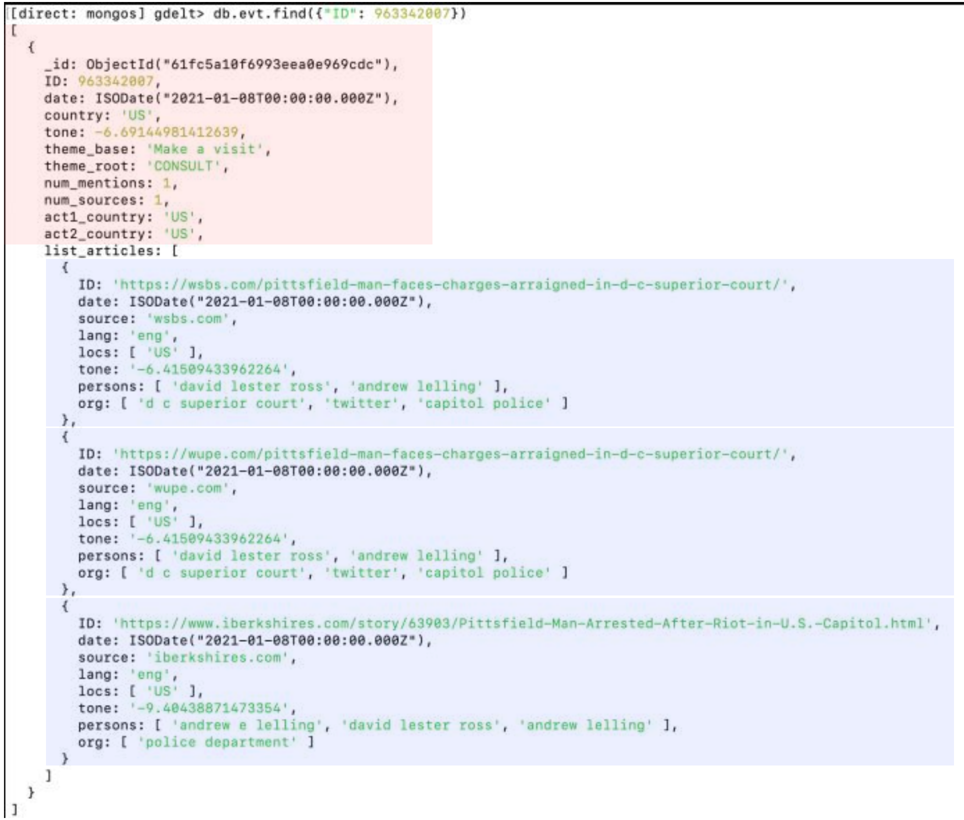
II. Recueil et stockage de la donnée

II. Modélisation sous forme de documents

- ➜ Documents : events
    - ➜ Embedded documents: articles



```
[direct: mongos] gdelt> db.evt.findOne()
{
  _id: ObjectId("61fc624a321004e857187507"),
  ID: 967254409,
  date: ISODate("2021-02-01T00:00:00.000Z"),
  country: 'AF',
  tone: -6.33484162895925,
  theme_base: 'Use conventional military force',
  theme_root: 'FIGHT',
  num_mentions: 4,
  num_sources: 1,
  act1_country: NaN,
  act2_country: 'AF',
  list_articles: [
    {
      ID: 'https://www.ebar.com/arts_&_culture/books/301570',
      date: ISODate("2021-02-01T00:00:00.000Z"),
      source: 'ebar.com',
      lang: 'eng',
      locs: [ 'AF' ],
      tone: '-6.19266055045872',
      persons: [
        'donovan russo',
        'frank paine',
        'anthony johnson',
        'steven cahill'
      ],
      org: [ 'seton hall university', 'young', 'yahoo' ]
    }
  ]
}
```

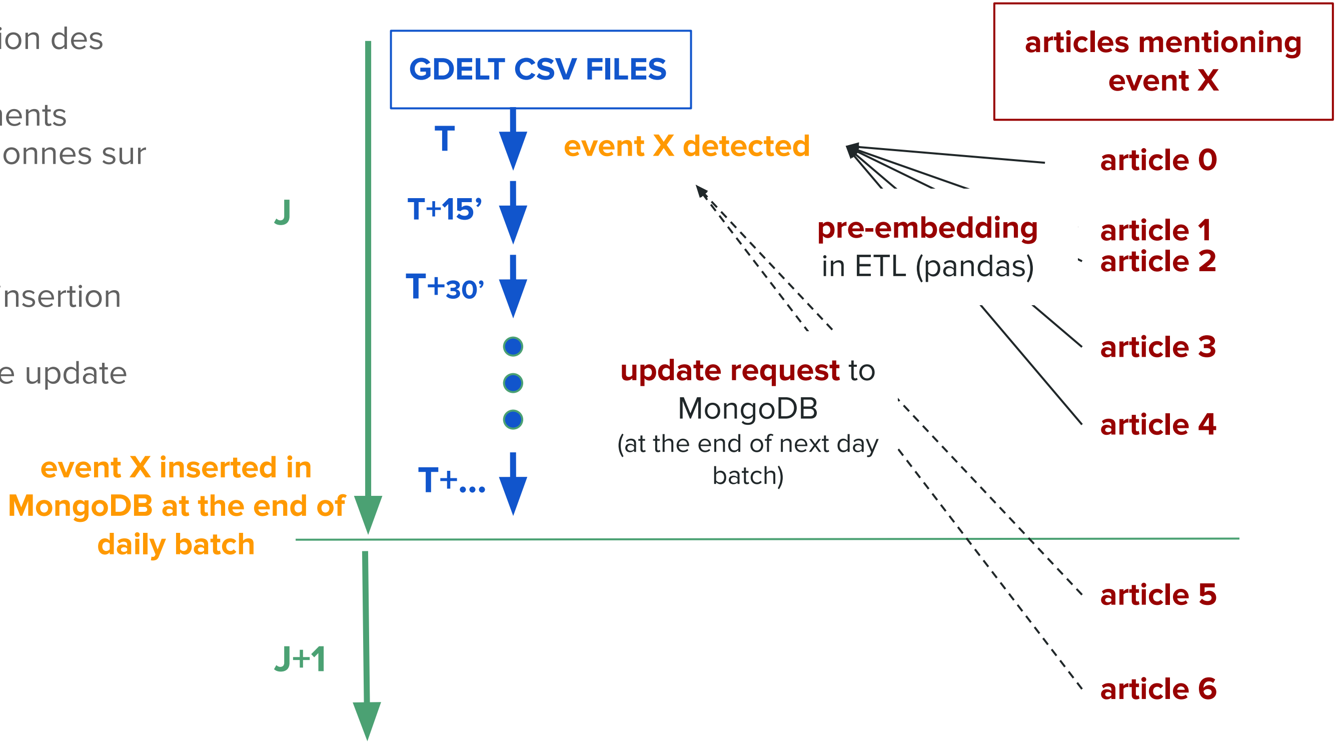


```
[direct: mongos] gdelt> db.evt.find({"ID": 963342007})
[
  {
    _id: ObjectId("61fc5a10f6993eea0e969cdc"),
    ID: 963342007,
    date: ISODate("2021-01-08T00:00:00.000Z"),
    country: 'US',
    tone: -6.69144981412639,
    theme_base: 'Make a visit',
    theme_root: 'CONSULT',
    num_mentions: 1,
    num_sources: 1,
    act1_country: 'US',
    act2_country: 'US',
    list_articles: [
      {
        ID: 'https://wsbs.com/pittsfield-man-faces-charges-arraigned-in-d-c-superior-court/',
        date: ISODate("2021-01-08T00:00:00.000Z"),
        source: 'wsbs.com',
        lang: 'eng',
        locs: [ 'US' ],
        tone: '-6.41509433962264',
        persons: [ 'david lester ross', 'andrew lelling' ],
        org: [ 'd c superior court', 'twitter', 'capitol police' ]
      },
      {
        ID: 'https://wupe.com/pittsfield-man-faces-charges-arraigned-in-d-c-superior-court/',
        date: ISODate("2021-01-08T00:00:00.000Z"),
        source: 'wupe.com',
        lang: 'eng',
        locs: [ 'US' ],
        tone: '-6.41509433962264',
        persons: [ 'david lester ross', 'andrew lelling' ],
        org: [ 'd c superior court', 'twitter', 'capitol police' ]
      },
      {
        ID: 'https://www.iberkshires.com/story/63903/Pittsfield-Man-Arrested-After-Riot-in-U.S.-Capitol.html',
        date: ISODate("2021-01-08T00:00:00.000Z"),
        source: 'iberkshires.com',
        lang: 'eng',
        locs: [ 'US' ],
        tone: '-9.40438871473354',
        persons: [ 'andrew e lelling', 'david lester ross', 'andrew lelling' ],
        org: [ 'police department' ]
      }
    ]
  }
]
```

II. ETL : script python utilisant pandas

- Récupération et transformation des champs utiles
  ➔ réduire la taille des documents
  11 colonnes sur events, 9 colonnes sur gkg

- Batchs journaliers avec pre-insertion des articles dans les events
  ➔ limiter les requêtes de type update (très longues)



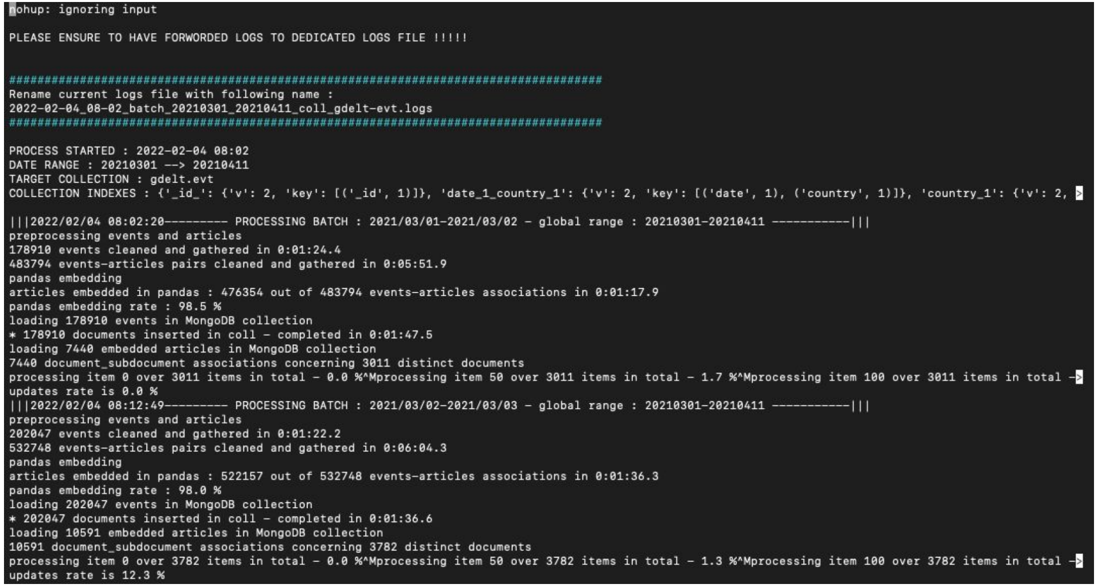
II. ETL : performance en écriture et volume chargé

➜ Extrait de logs d’insertion

Temps d’insertion :

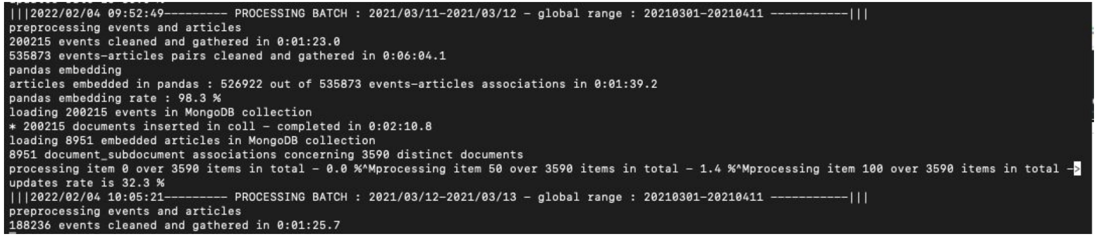
- 6 min / jour si 100k events
- 10 min/jour si 200k events
- env. 4h/mois

➜ Nombre de total de documents chargés : XX events (XX mois)



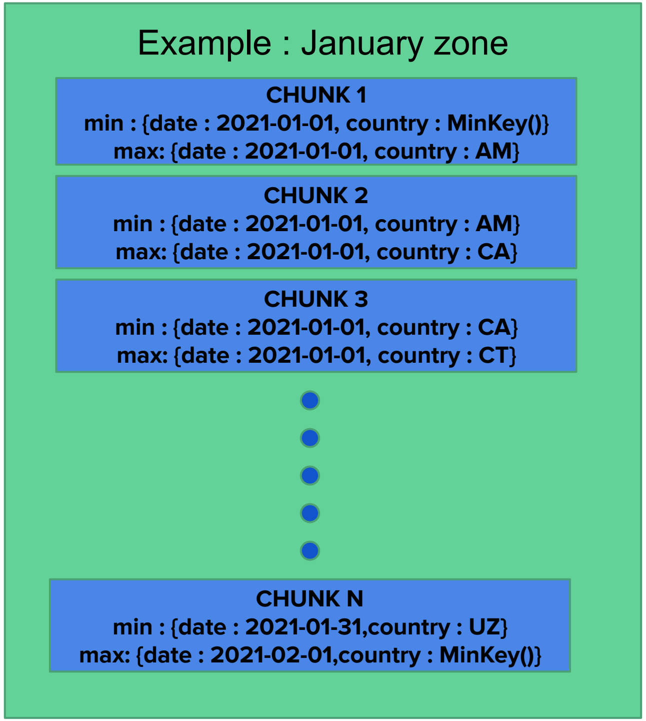
```
nohup: ignoring input

PLEASE ENSURE TO HAVE FORWORDED LOGS TO DEDICATED LOGS FILE !!!!!


##################################################################################
Rename current logs file with following name :
2022-02-04_08-02_batch_20210301_20210411_coll_gdelt-evt.logs
##################################################################################

PROCESS STARTED : 2022-02-04 08:02
DATE RANGE : 20210301 --> 20210411
TARGET COLLECTION : gdelt.evt
COLLECTION INDEXES : {'_id_': {'v': 2, 'key': [('_id', 1)]}, 'date_1_country_1': {'v': 2, 'key': [('date', 1), ('country', 1)]}, 'country_1': {'v': 2, >

|||2022/02/04 08:02:20---------- PROCESSING BATCH : 2021/03/01-2021/03/02 - global range : 20210301-20210411 ------------|||
preprocessing events and articles
178910 events cleaned and gathered in 0:01:24.4
483794 events-articles pairs cleaned and gathered in 0:05:51.9
pandas embedding
articles embedded in pandas : 476354 out of 483794 events-articles associations in 0:01:17.9
pandas embedding rate : 98.5 %
loading 178910 events in MongoDB collection
* 178910 documents inserted in coll - completed in 0:01:47.5
loading 7440 embedded articles in MongoDB collection
7440 document_subdocument associations concerning 3011 distinct documents
processing item 0 over 3011 items in total - 0.0 %^Mprocessing item 50 over 3011 items in total - 1.7 %^Mprocessing item 100 over 3011 items in total ->
updates rate is 0.0 %
|||2022/02/04 08:12:49---------- PROCESSING BATCH : 2021/03/02-2021/03/03 - global range : 20210301-20210411 ------------|||
preprocessing events and articles
202047 events cleaned and gathered in 0:01:22.2
532748 events-articles pairs cleaned and gathered in 0:06:04.3
pandas embedding
articles embedded in pandas : 522157 out of 532748 events-articles associations in 0:01:36.3
pandas embedding rate : 98.0 %
loading 202047 events in MongoDB collection
* 202047 documents inserted in coll - completed in 0:01:36.6
loading 10591 embedded articles in MongoDB collection
10591 document_subdocument associations concerning 3782 distinct documents
processing item 0 over 3782 items in total - 0.0 %^Mprocessing item 50 over 3782 items in total - 1.3 %^Mprocessing item 100 over 3782 items in total ->
updates rate is 12.3 %
```

•••••••••••••••••••••••••••••



```
|||2022/02/04 09:52:49---------- PROCESSING BATCH : 2021/03/11-2021/03/12 - global range : 20210301-20210411 ------------|||
preprocessing events and articles
200215 events cleaned and gathered in 0:01:23.0
535873 events-articles pairs cleaned and gathered in 0:06:04.1
pandas embedding
articles embedded in pandas : 526922 out of 535873 events-articles associations in 0:01:39.2
pandas embedding rate : 98.3 %
loading 200215 events in MongoDB collection
* 200215 documents inserted in coll - completed in 0:02:10.8
loading 8951 embedded articles in MongoDB collection
8951 document_subdocument associations concerning 3590 distinct documents
processing item 0 over 3590 items in total - 0.0 %^Mprocessing item 50 over 3590 items in total - 1.4 %^Mprocessing item 100 over 3590 items in total ->
updates rate is 32.3 %
|||2022/02/04 10:05:21---------- PROCESSING BATCH : 2021/03/12-2021/03/13 - global range : 20210301-20210411 ------------|||
preprocessing events and articles
188236 events cleaned and gathered in 0:01:25.7
```

II. Structure du stockage dans MongoDB



Example : January zone

CHUNK 1
min : {date : 2021-01-01, country : MinKey()}
max: {date : 2021-01-01, country : AM}

CHUNK 2
min : {date : 2021-01-01, country : AM}
max: {date : 2021-01-01, country : CA}

CHUNK 3
min : {date : 2021-01-01, country : CA}
max: {date : 2021-01-01, country : CT}

CHUNK N
min : {date : 2021-01-31,country : UZ}
max: {date : 2021-02-01,country : MinKey()}

➔ MongoDB organise les données en chunks de 64 Mo sur les RS / shards

➔ Identification de la clé de sharding déterminante = optimisation du temps d’écriture et de lecture

[~~date~~] ?

[date ; evt_country]

➔ Répartition des chunks entre les shards = limiter les transferts réseaux inutiles

géré ~~automatiquement~~ par le load balancer ?

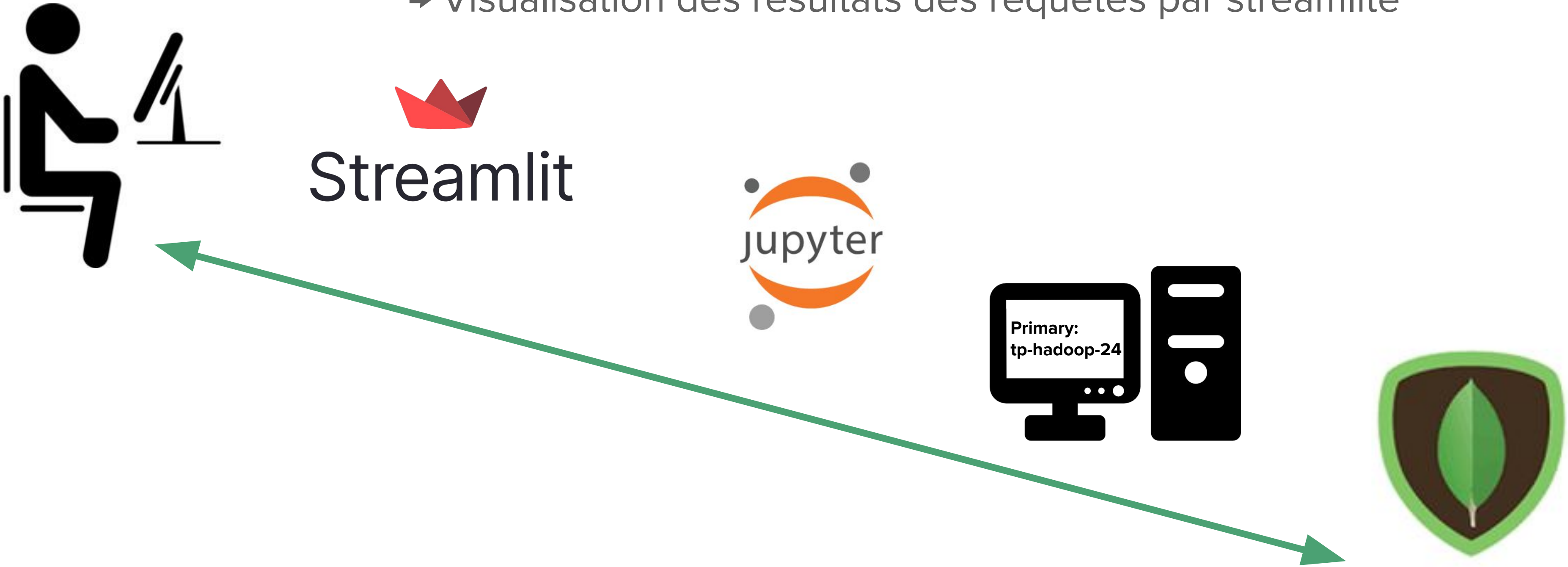
prédéfini (zones par mois)

III. Conception et test des requêtes

III. Conception et visualisation des requêtes

→ Connexion à la DB via PyMongo : jupyter notebook distant

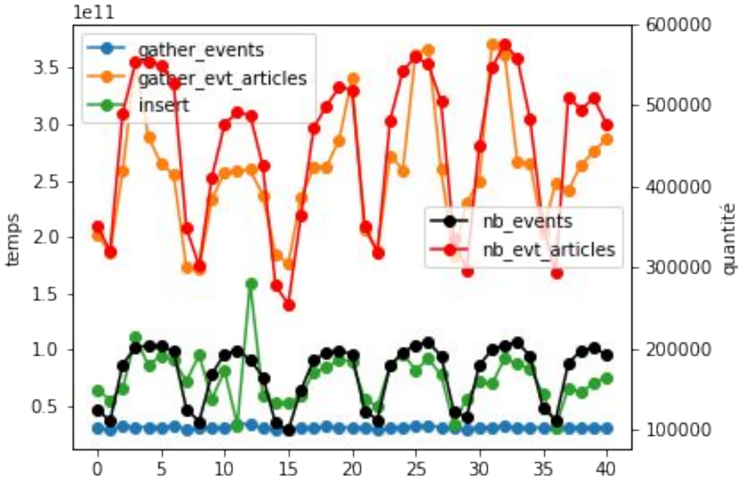
→ Visualisation des résultats des requêtes par streamlite



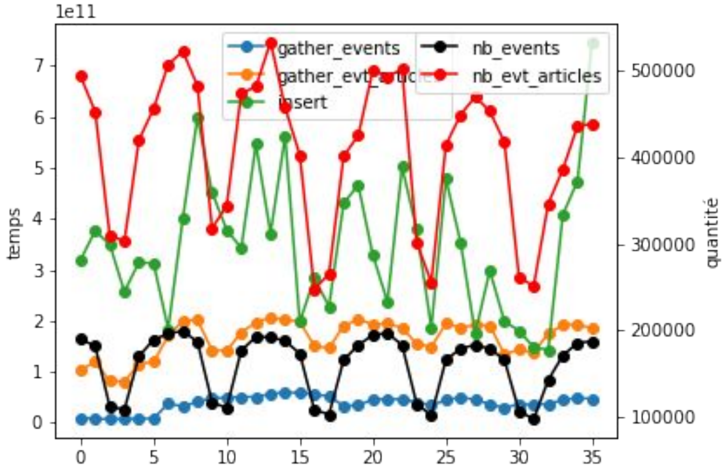
Questions ?

Analyse des logs d’insertion

Avant le “rush”



Pendant le “rush”

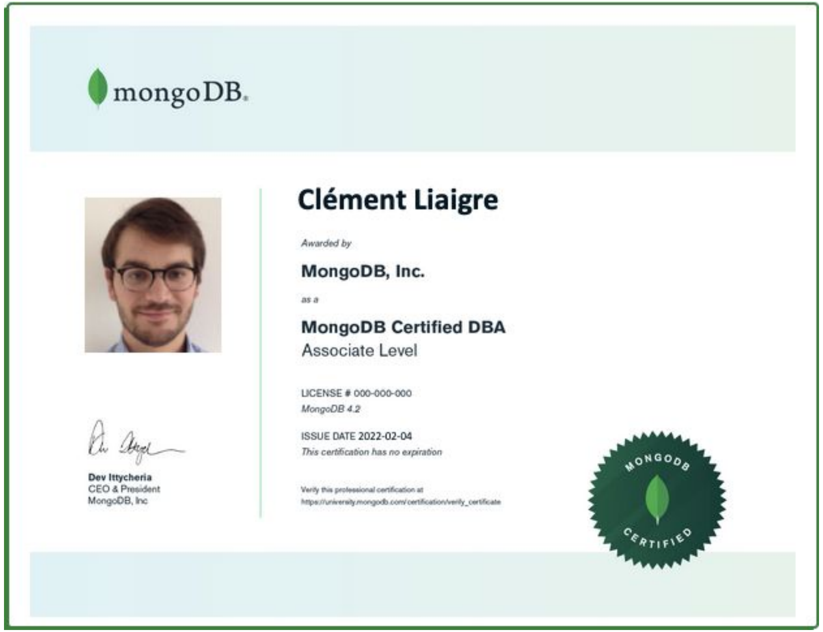


A partir de de mercredi, on voit que les temps d’insertion :

1) augmentent considérablement
2) ne dépendent plus du volume de données injecté mais de facteurs “externes”

➔ **surcharge du cluster OpenStack**

Présentation des experts



mongoDB.

Clément Liaigre

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Associate Level

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CEO & President
MongoDB, Inc

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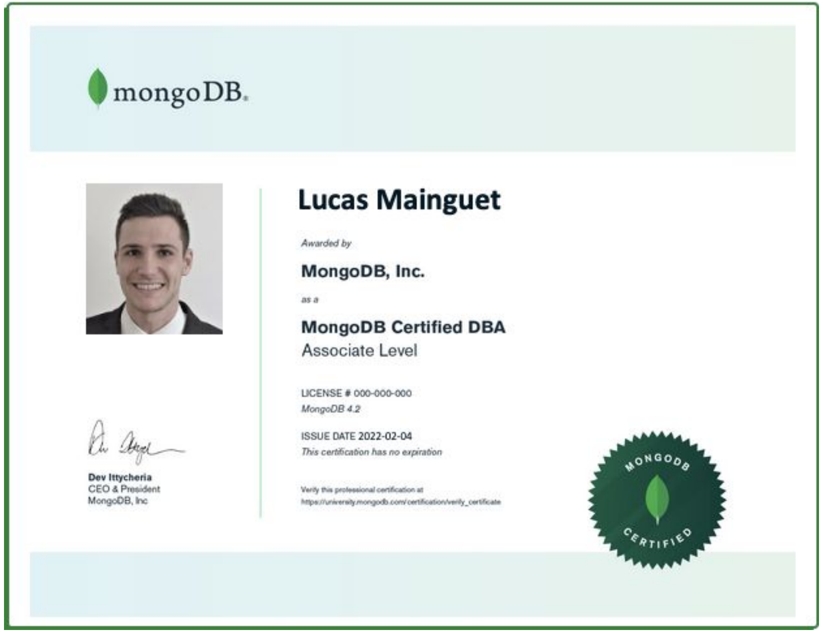

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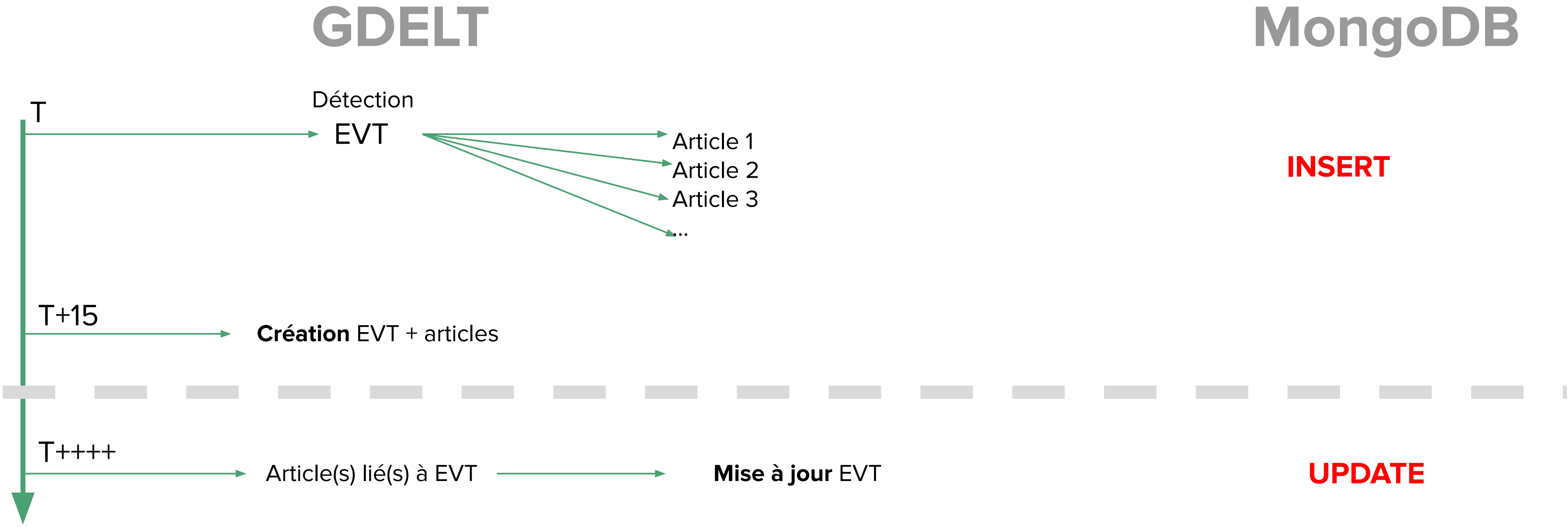
II. ETL



GDELT

MongoDB

T

Détection

EVT

Article 1

Article 2

Article 3

...

INSERT

T+15

Création EVT + articles

T++++

Article(s) lié(s) à EVT

Mise à jour EVT

UPDATE