

(The art of not shooting yourself in the foot using Elasticsearch)

# Using Elasticsearch as the Primary Data Store

CNCML Vienna  
2019-04-24  
@cloudnativecv  
#CNCML19

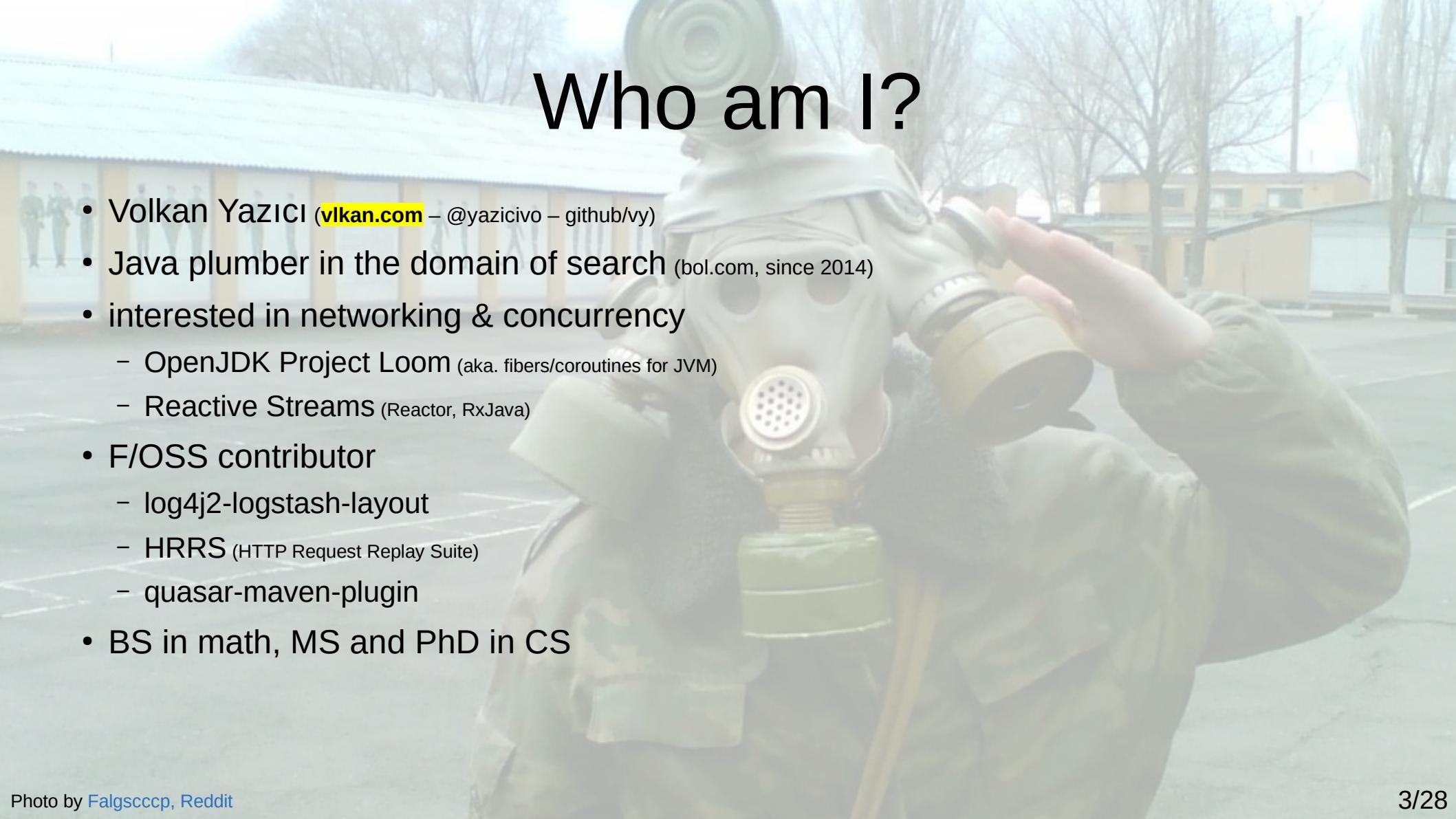
Volkan Yazıcı  
<https://vlkan.com>  
@yazicivo

# Poll time!

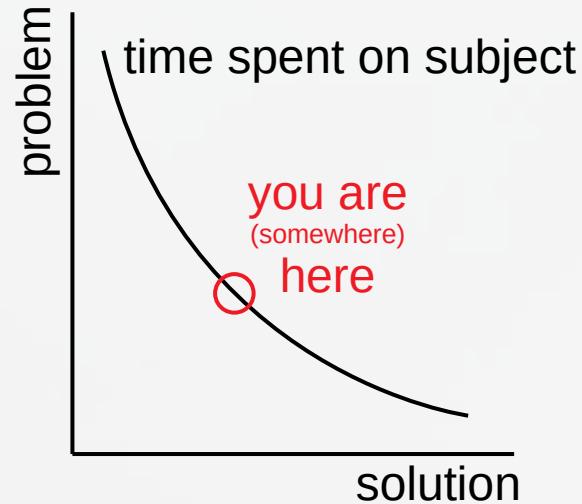
- Recently purchased an item online?
- Elasticsearch users?
- Elasticsearch users with 10+ node clusters?
- Updating Elasticsearch indices real-time?

# Who am I?

- Volkan YAZICI ([vlkan.com](http://vlkan.com) – @yazicivo – github/vy)
- Java plumber in the domain of search ([bol.com](http://bol.com), since 2014)
- interested in networking & concurrency
  - OpenJDK Project Loom (aka. fibers/coroutines for JVM)
  - Reactive Streams (Reactor, RxJava)
- F/OSS contributor
  - log4j2-logstash-layout
  - HRRS (HTTP Request Replay Suite)
  - quasar-maven-plugin
- BS in math, MS and PhD in CS



# Disclaimer





9+ million active<sup>1</sup> clients<sup>2</sup>  
17+ million articles<sup>2</sup>  
200k+ sellers<sup>2</sup>  
1500+ employees<sup>2</sup>  
62+ million visits/month<sup>2</sup>

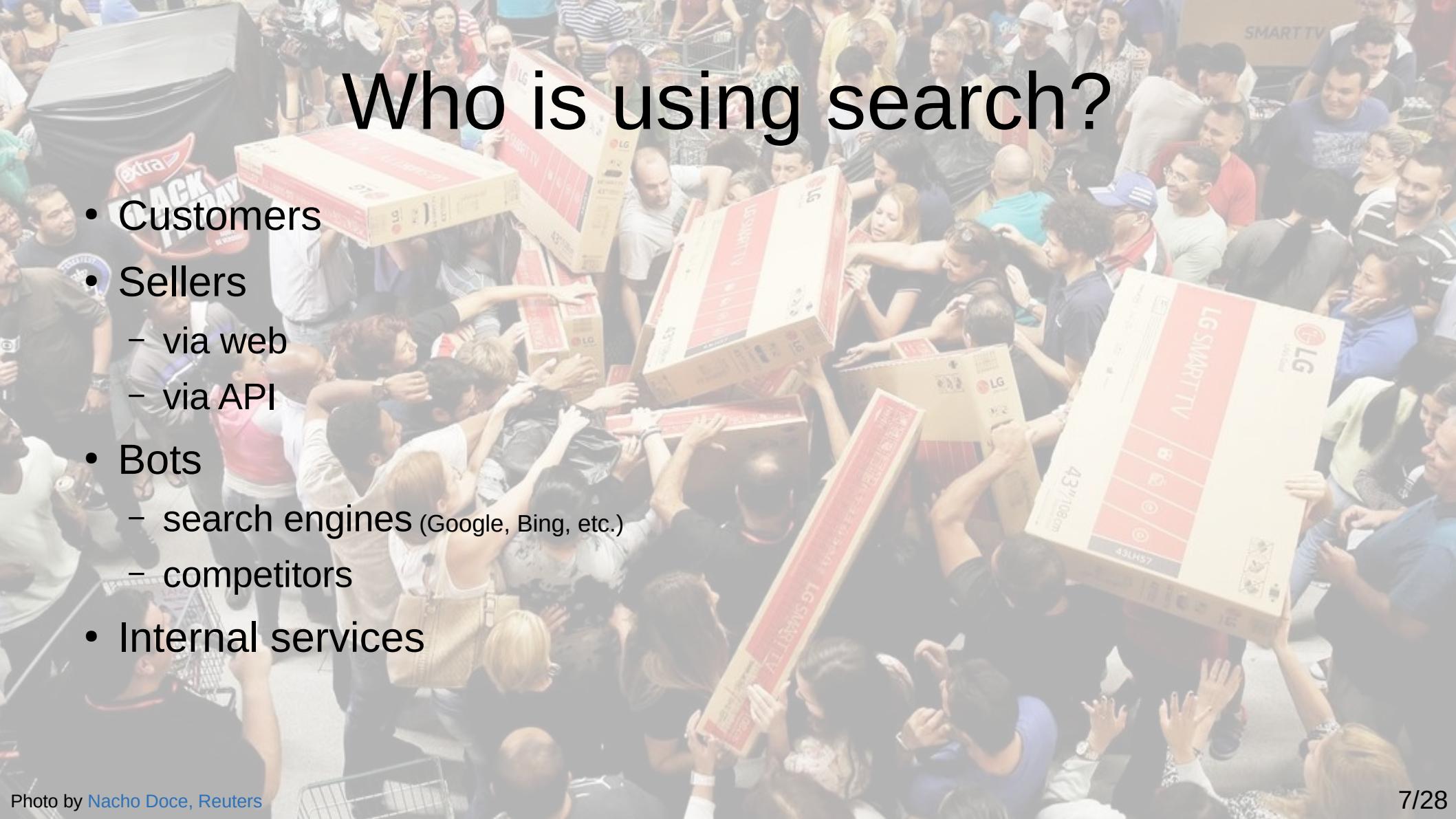
<sup>1</sup> Customers who ordered an item in the last 365 days.

<sup>2</sup> As of October 2018.

# E-commerce search

- Search
  - Matching
  - Ranking
  - Faceting
- Guidance
  - Suggestions
  - Auto-corrections
  - Recommendations

The screenshot shows the bol.com website search results for 'wijnglazen'. The search bar at the top contains the query 'wijnglazen'. Below the search bar, there are filters for Categorieën (Koken & Tafelen, Glazen, Wijnglazen), Merk (Riedel, Schott Zwiesel, Royal Leerdam), Kleur (Transparent, Zwart, Multi), Aantal glazen (6, 1, 2), and Opties (Vaatwasserbestendig, Y, Met voet). The main search results are displayed in two sections: 'wijnglazen' in Alle Artikelen (1.268 resultaten) and 'Cadeautip' (Leonardo Puccini Witte Wijnglas - 6 Stuks and Leonardo Puccini Rode wijnglas - 0,75 l - 6 stuks). Each product listing includes a small image, the brand name, product name, price (24,- and 30,56 respectively), a 'Cadeautip' badge, a 'Op voorraad' badge, and a 'Select bezorgspies' badge.

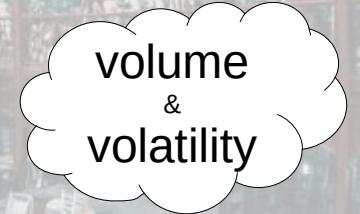
A photograph showing a large, dense crowd of people in what appears to be a Best Buy store during a Black Friday sale. Many individuals are holding up large boxes, with several clearly labeled "LG SMART TV". Other products visible include a "KELLOGG'S" cereal box and a "PACIFIC" brand item. The scene is chaotic, with people pushing and reaching for items.

# Who is using search?

- Customers
- Sellers
  - via web
  - via API
- Bots
  - search engines (Google, Bing, etc.)
  - competitors
- Internal services

# Search input

- Product attributes (title, EAN, ISBN, color, etc.)
- Seller offers (price, availability, deliverability)
- Derived content (for ranking)
  - Sale popularity
  - Price quality
  - Customer feedback (reviews, etc.)
- Configuration (faceting, value translations, etc.)



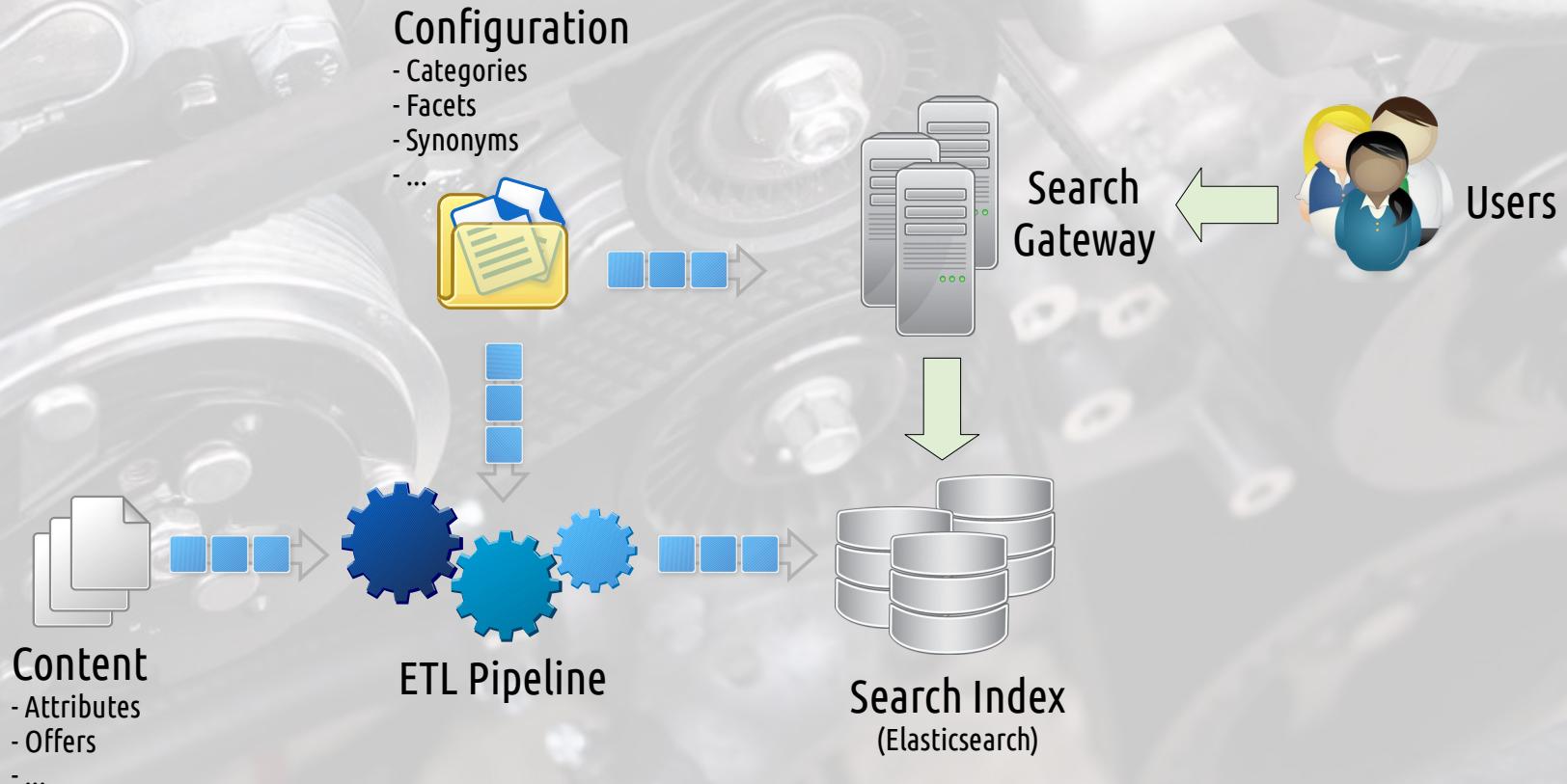
volume  
&  
volatility



# Search output

- Hits (products and offers)
- Facets
- Auto-corrections
- Redirects (huge SEO impact)

# Architecture overview



# Data arrival latency

Source	Past	Present	Future
Attributes	1/24h	streaming	streaming
Offers	streaming	streaming	streaming
Facets	1/24h	1/24h	streaming
Indexing	1/24h	1/5h	streaming

# Performance

- Search
- ETL
- Caching

(see [Varnishing Search Performance](#))



Photo by [Vidar Nordli-Mathisen](#)

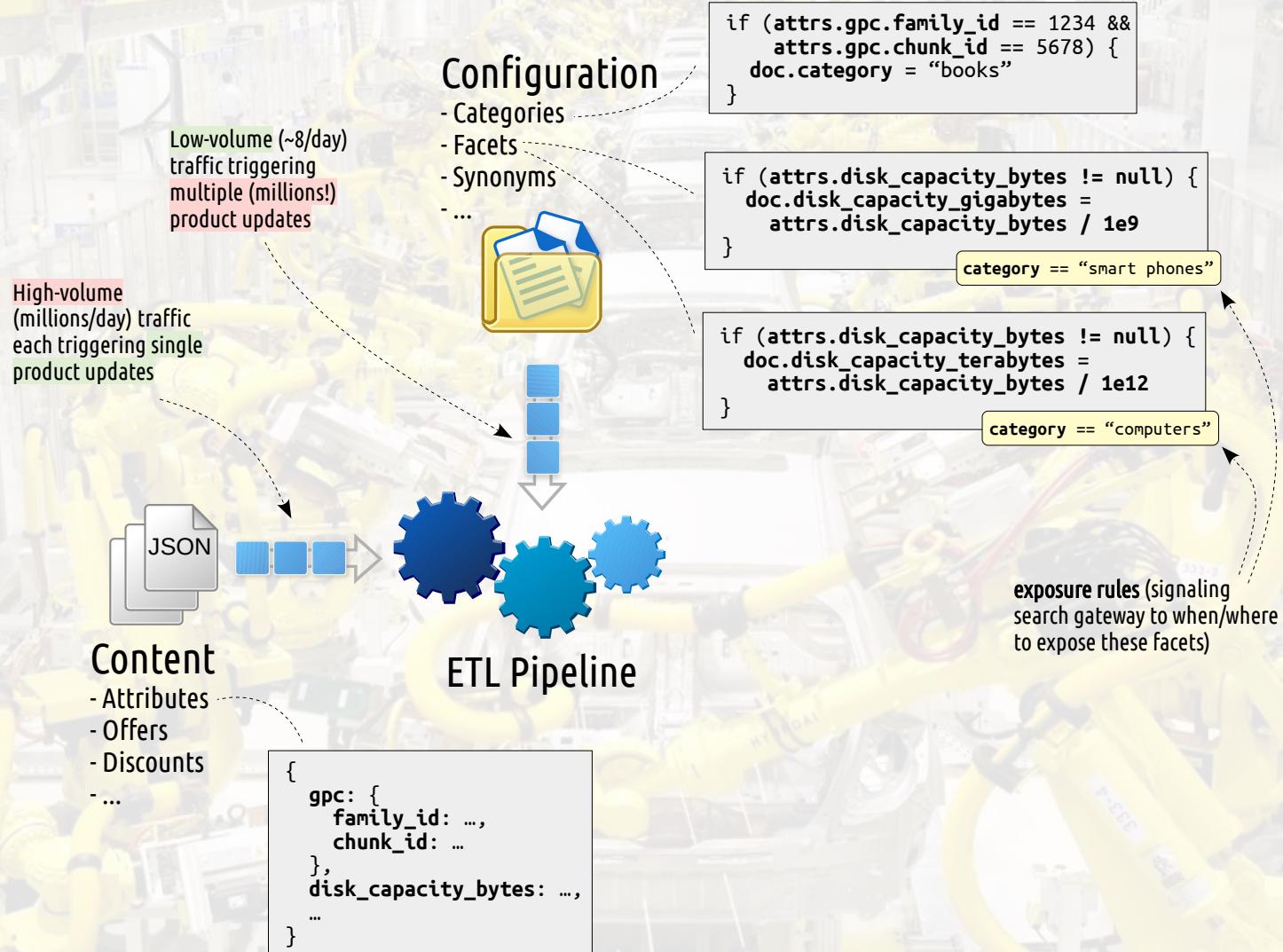


Photo by [Adrian Schulte, MSC Public Affairs, U.S. Navy](#)

A wide-angle photograph of a vehicle assembly line in a factory. Numerous yellow industrial robots with black joints are positioned along a conveyor belt, working on the frames of white cars. The robots are connected by a complex network of yellow and red hoses. The factory floor is made of concrete, and there are metal railings and walkways on both sides. In the background, there are more industrial structures and equipment.

# ETL

(Extract, Transform, Load)



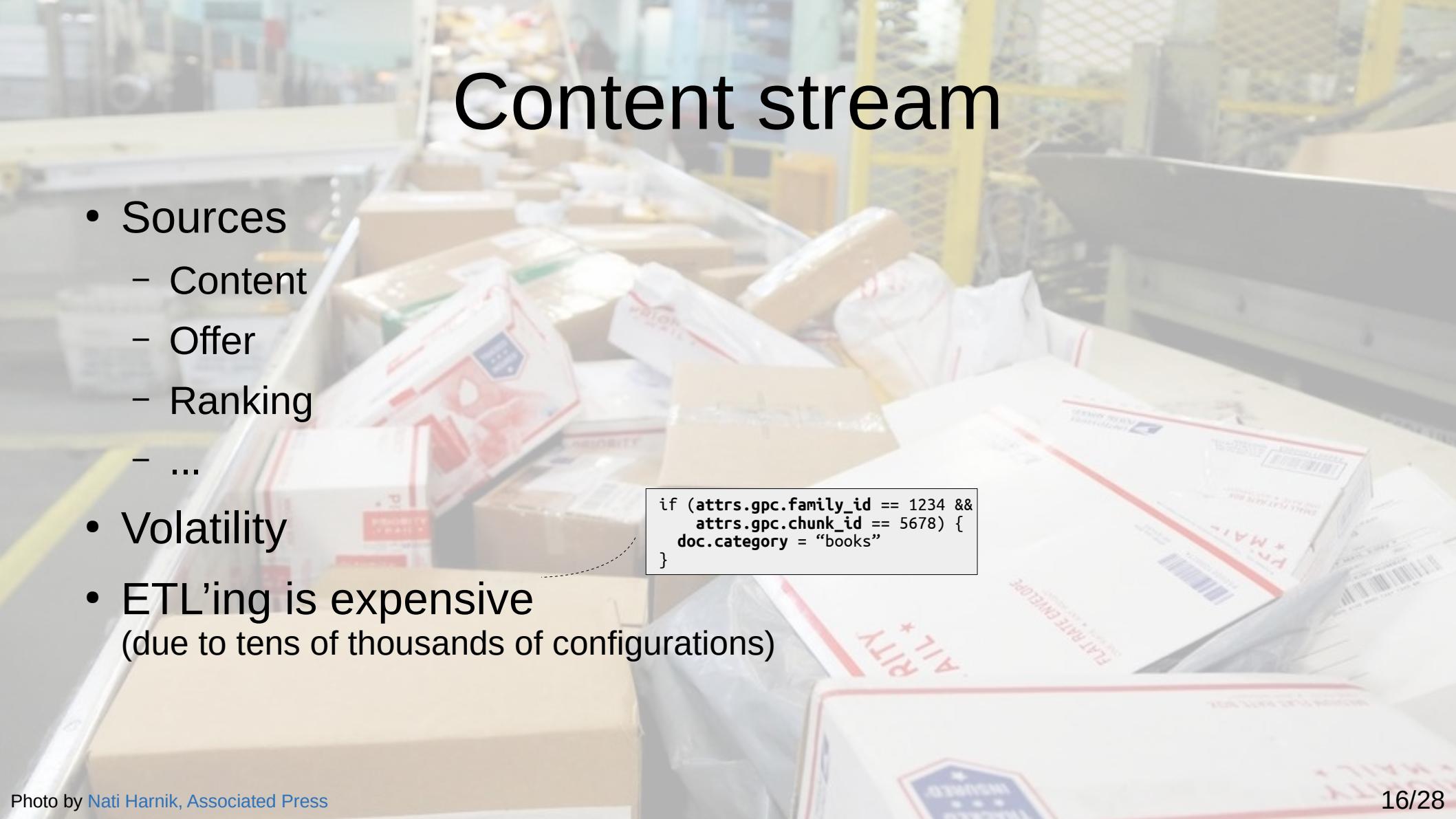
# Why ETL at all?

Strategy	Advantages	Disadvantages
Without ETL	Changes take immediate effect	Latency and throughput hurts Aggregations become impractical
With ETL	Optimal query-time performance	Need to bake affected products

# Content stream

- Sources
  - Content
  - Offer
  - Ranking
  - ...
- Volatility
- ETL'ing is expensive  
(due to tens of thousands of configurations)

```
if (attrs.gpc.family_id == 1234 &&
    attrs.gpc.chunk_id == 5678) {
    doc.category = "books"
}
```



# Configuration stream

- Business screens
  - Configuration snapshots
  - Query on any field
- Volatility
- Retrospective changes



```
if (attrs.gpc.family_id == 1234 &&
    attrs.gpc.chunk_id == 5678) {
    doc.category = "books"
}
```

# ETL Operational Overview

H1-H6  
Design

1. n
2. n
3. n

- n
- n
- n
- n
- n
- n
- n

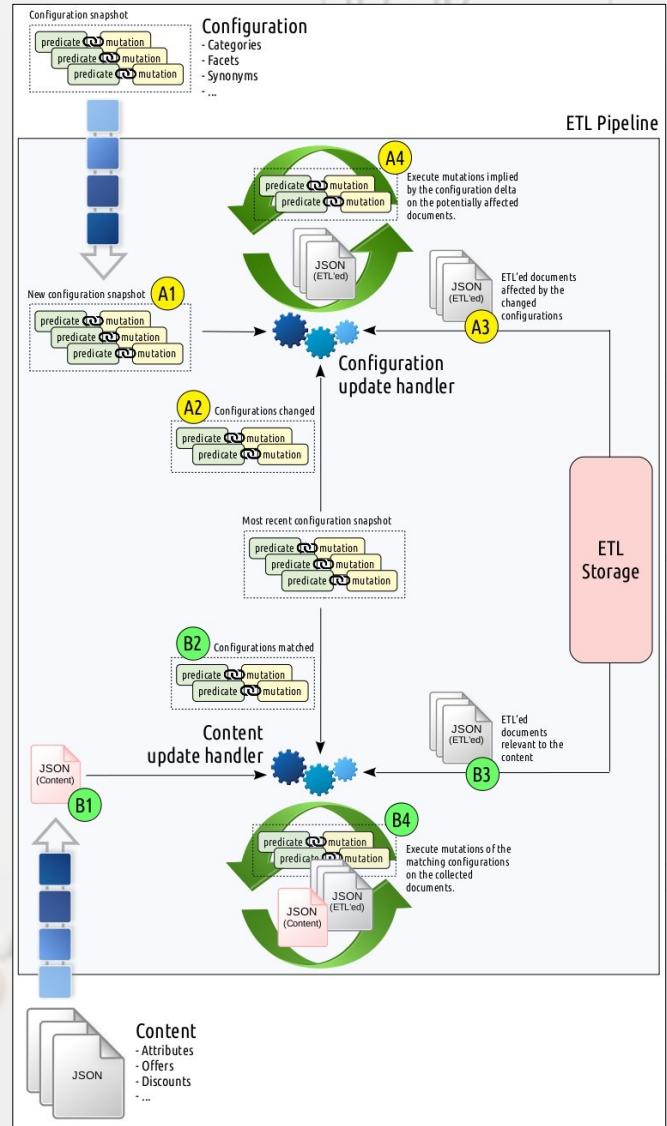
H1-Headline

- n
- n
- n
- n

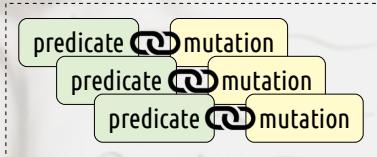
Menu

Video  
module





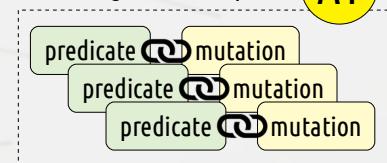
## Configuration snapshot



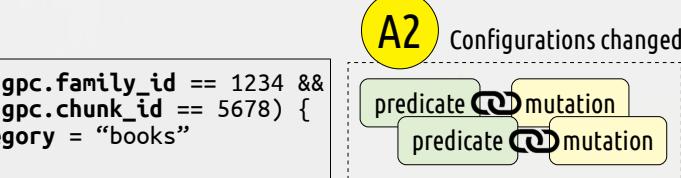
## Configuration

- Categories
- Facets
- Synonyms
- ...

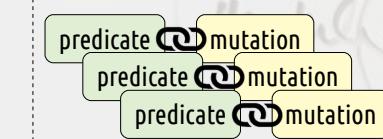
### New configuration snapshot



```
if (attrs.gpc.family_id == 1234 &&  
    attrs.gpc.chunk_id == 5678) {  
    doc.category = "books"  
}
```



### Most recent configuration snapshot



A2 Configurations changed

A1

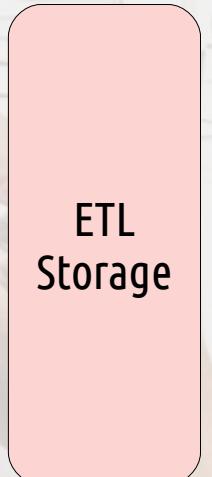
A4

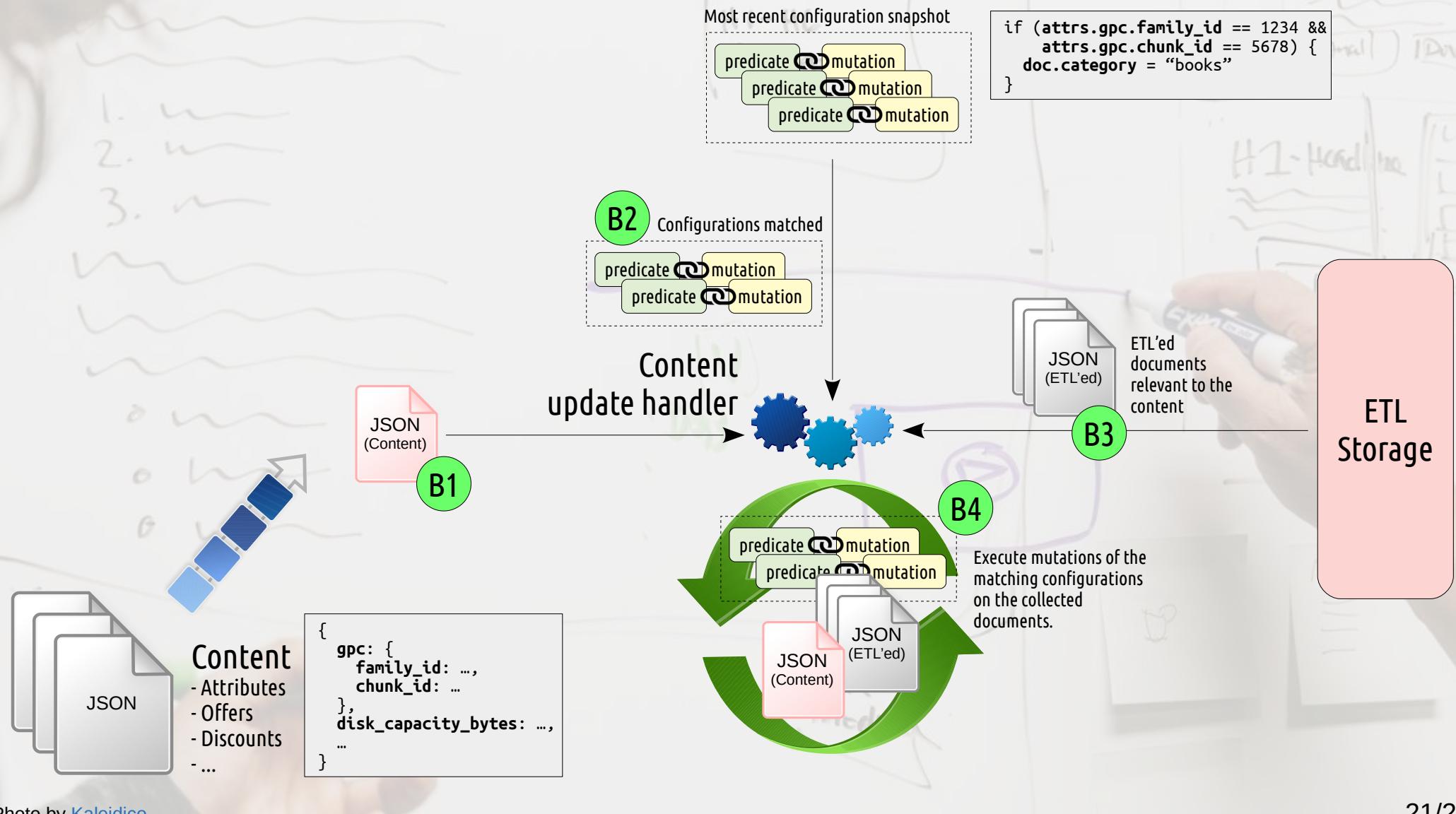
A3

Configuration update handler

Execute mutations implied by the configuration delta on the potentially affected documents.

ETL'ed documents affected by the changed configurations





# Old ETL

- One giant PL/SQL troop marching 1/24h
- “Baseline” taking ~12h
- Failures hurt a lot
- Difficult to
  - innovate
  - debug
  - observe
- At the edge of software limits
  - e.g. max column count
  - multiple threads in PL/SQL
  - optimizer hints getting broken as
    - upgrades take place
    - data size change



# Battle of ETL Storage Solutions

Storage Solution	Distributed?	Sharded?	Required Indices	Integrity Measure
PostgreSQL	No	No	One <sup>1</sup>	Transactions
PostgreSQL (partitioned)	No	Yes <sup>2</sup>	One <sup>1</sup>	Transactions
MongoDB	Yes	Yes <sup>3</sup>	Some <sup>4</sup>	Transactions/CAS <sup>5</sup>
Elasticsearch	Yes	Yes	None	CAS <sup>6</sup>

1) PostgreSQL jsonb index covers all fields.

2) PostgreSQL partitioning is not sharding in distributed sense, but still serves a similar purpose.

3) MongoDB sharding requires manual configuration.

4) MongoDB requires an explicit index for each whitelisted field allowed in ETL configuration predicates.

5) MongoDB updateMany() or findAndModify() can be leveraged for the desired integrity.

6) Elasticsearch \_version field can be leveraged to implement a CAS (compare-and-swap) loop.

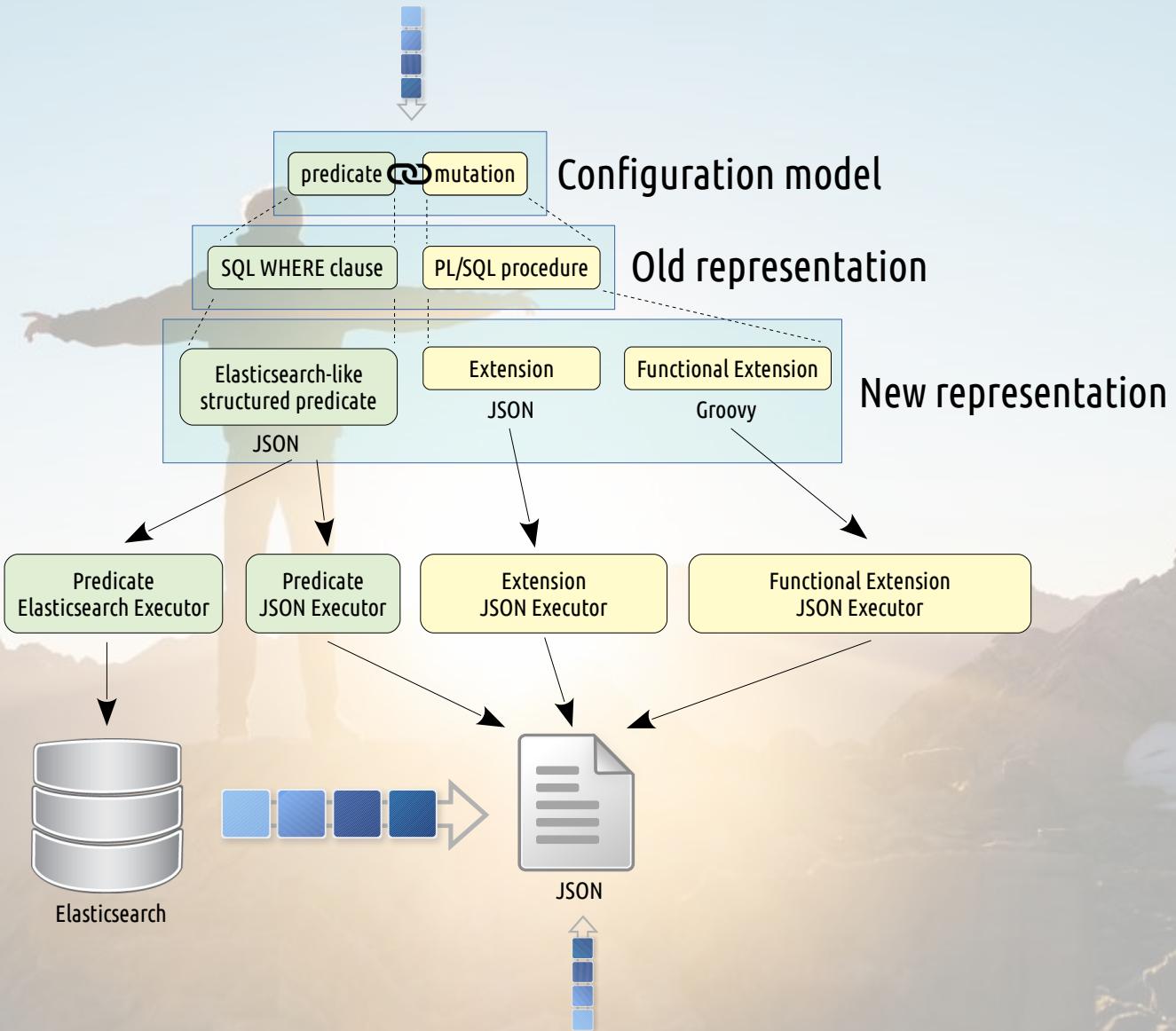


# New ETL

# Storage solution winner: Elasticsearch



- Versatile query support
- Implicit indexing
- Scales good for reads, ok'ish for writes
- Easy to maintain
- Extensive experience



# TL;DR

Google-like search != e-commerce search  
(though both employ full-text search)

ETL = the art of cooking content (for search)

ETL rules necessitate search as well  
(due to excessive faceting)

Elasticsearch is a good candidate for storage in ETL



# Thank you!

(Questions?)

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