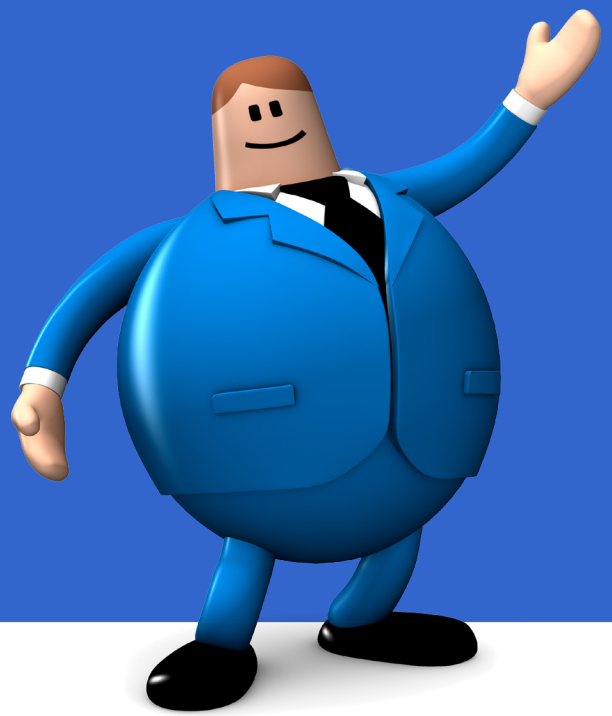
Half a year of Measuring 2.0 in production at bol.com



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de winkel van ons allemaal

Agenda

- Motivation
- Design
- Production experiences
  - Measurements
  - Kafka
  - Trending products
  - Avro/Parquet
- Future plans

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Ivan Budinčević

- ibudincevic@bol.com
- PhD in nuclear physics KU Leuven 2015
- Data analysis with python
- Java developer at bol.com since 2016
- Interested in big data technologies, streaming data processing

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Motivation

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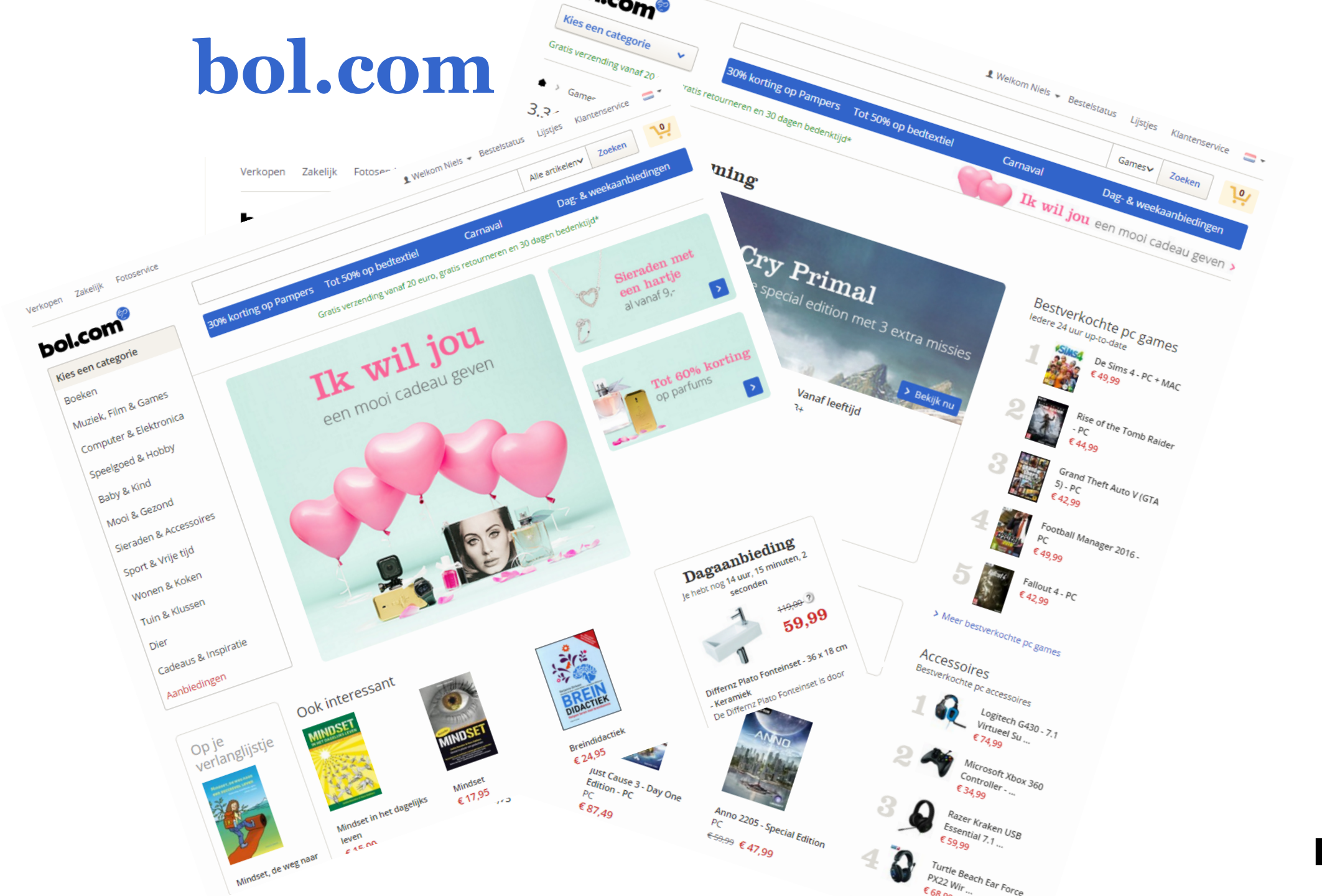

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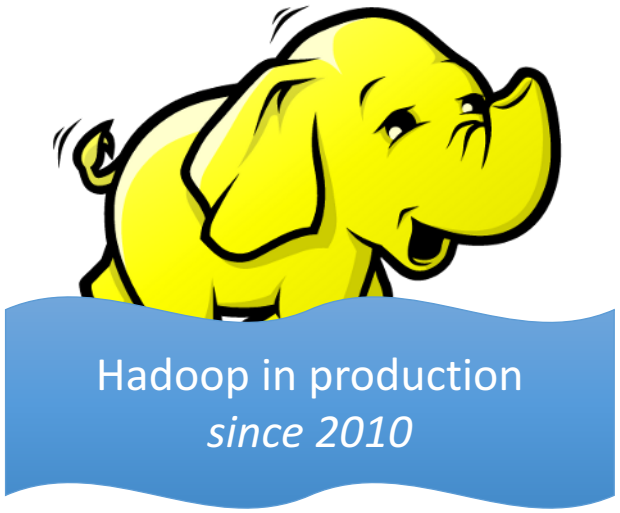
> 15 million products for sale
> 50 million in catalog

> 6 million active customers
> 27 million visits per month

> 4 billion
pageviews/year

bol.com



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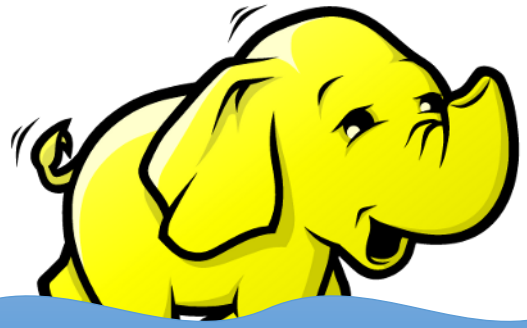

Hadoop in production
since 2010

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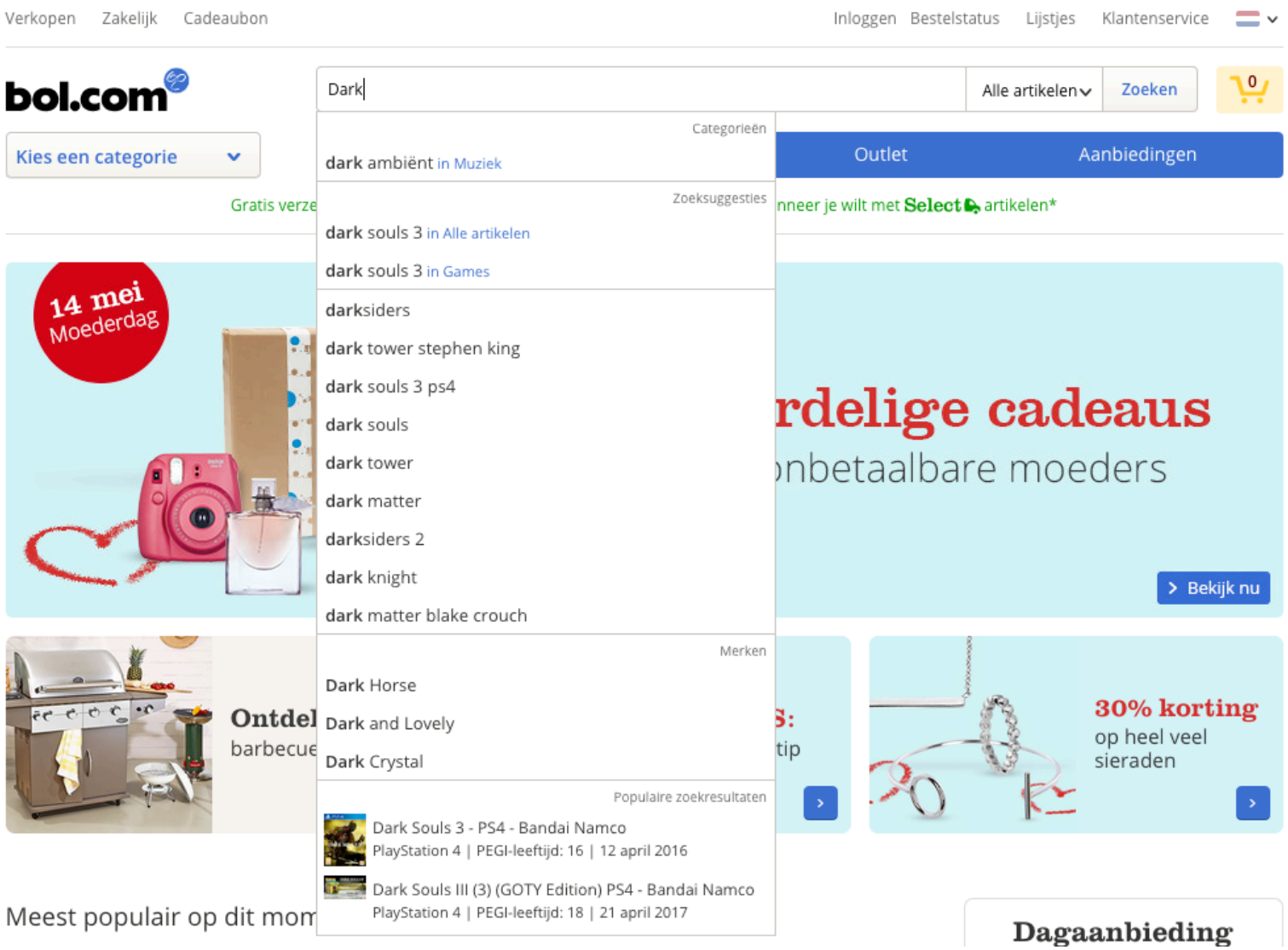
Search suggestions



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Personalization

Je bekeek Ook interessant:

In The Mood Wicker - Sierkussen - Paa...

In The Mood Pailletten Klein -...

€ 18,99

In The Mood Turijn - Sierkussen - Paa...

€ 13,99

In The Mood Koffieboon -...

€ 18,99

› Bekijk al je persoonlijke aanbevelingen

Speciaal voor jou geselecteerd

Microsoft Office 365 Personal - Neder...

€ 69,00

12 - 99 jaar

United Entertainment - Magic Wine Dec...

€ 17,95

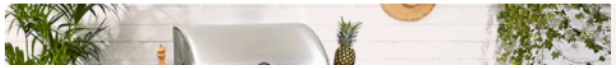
Microsoft Windows 7 Professional - En...

€ 69,99

Microsoft Office 365 Home - Nederland...

€ 99,00

› Bekijk al je persoonlijke aanbevelingen



Dagaanbieding

Je hebt nog **10 uur, 40 minuten, 35 seconden**

Populaire cd's en films voor 10 euro!

Alleen vandaag: populaire cd's en films waar moeders dol op zijn voor maar 10 euro! Zoals de nieuwe John Mayer, O'G3NE en Soof 2!

› Naar de actie

› Ontvang elke dag de dagaanbieding

Tip voor jou

Misschien heb je interesse in dit artikel?

Dark Souls 3 - Windows

Windows

€ 29,99

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Personalization

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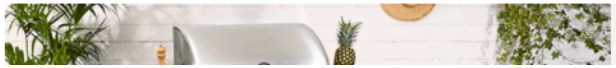

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€ 29,99

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How do we react to customer needs in real-time?

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How do we react to customer needs in real-time?

- Measure customer behavior and take action in real-time

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How do we react to customer needs in real-time?

- Measure customer behavior and take action in real-time

- Measure EVERYTHING

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Goals of “Measuring 2.0”

- Measure everything on our website
  - All interactions (also AJAX)
  - All channels (also mobile, email, …)
  - All countries
  - All details
  - All visitors
- More reliable data
- Lowest possible load on the client
- Lowest possible latency (< 1 second)

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Goals of “Measuring 2.0”

- Developer
  - Easy to build
  - Easy to validate
  - Test automation
- Business
  - Always measure everything
  - Data is “independent”
    - New questions are allowed

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Goals of “Measuring 2.0”

- Privacy
  - Personal Data Protection Act
    - *Wet bescherming persoonsgegevens*
  - No profiling beyond 2 years
- Security
  - Avoid storing “login” info.
- Business
  - Do “profiling” on everything
  - For many years (>2)

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Design

Design

Start

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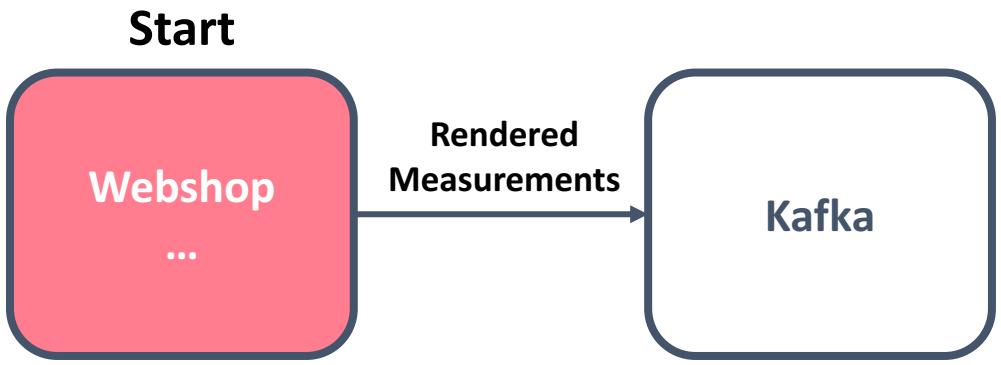
Design



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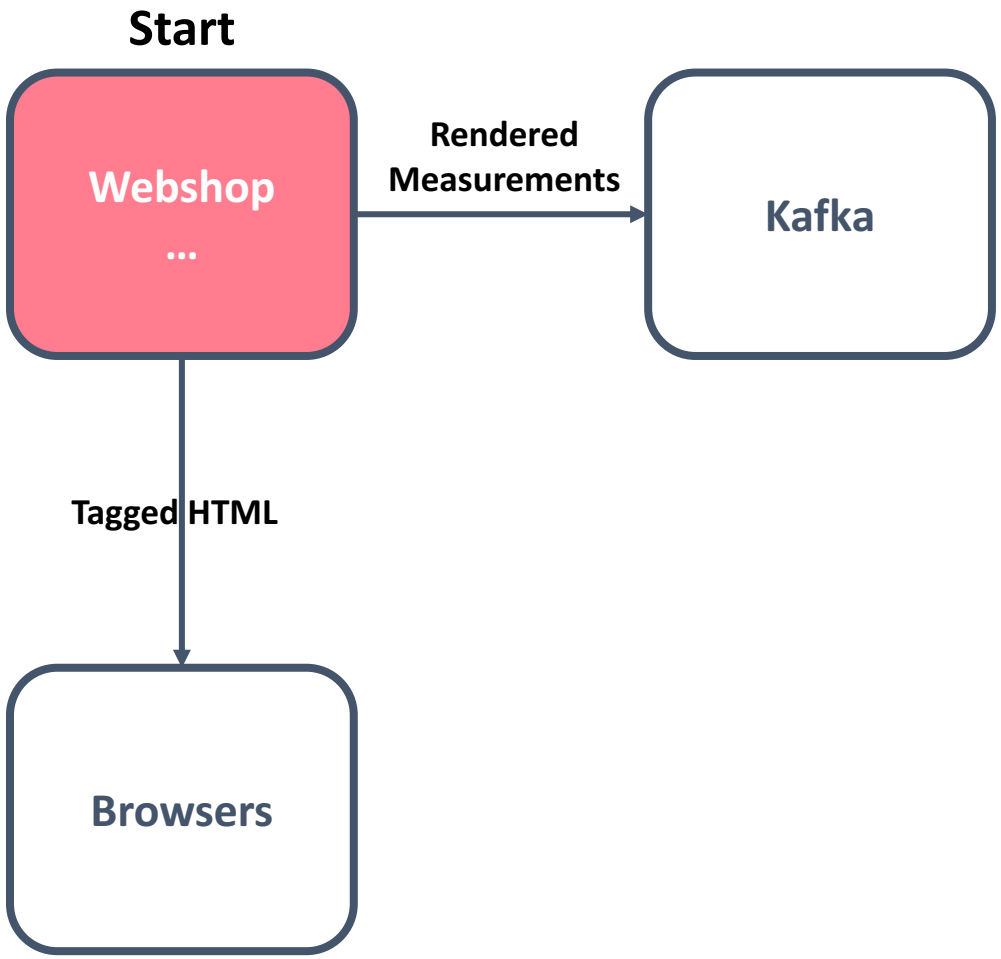

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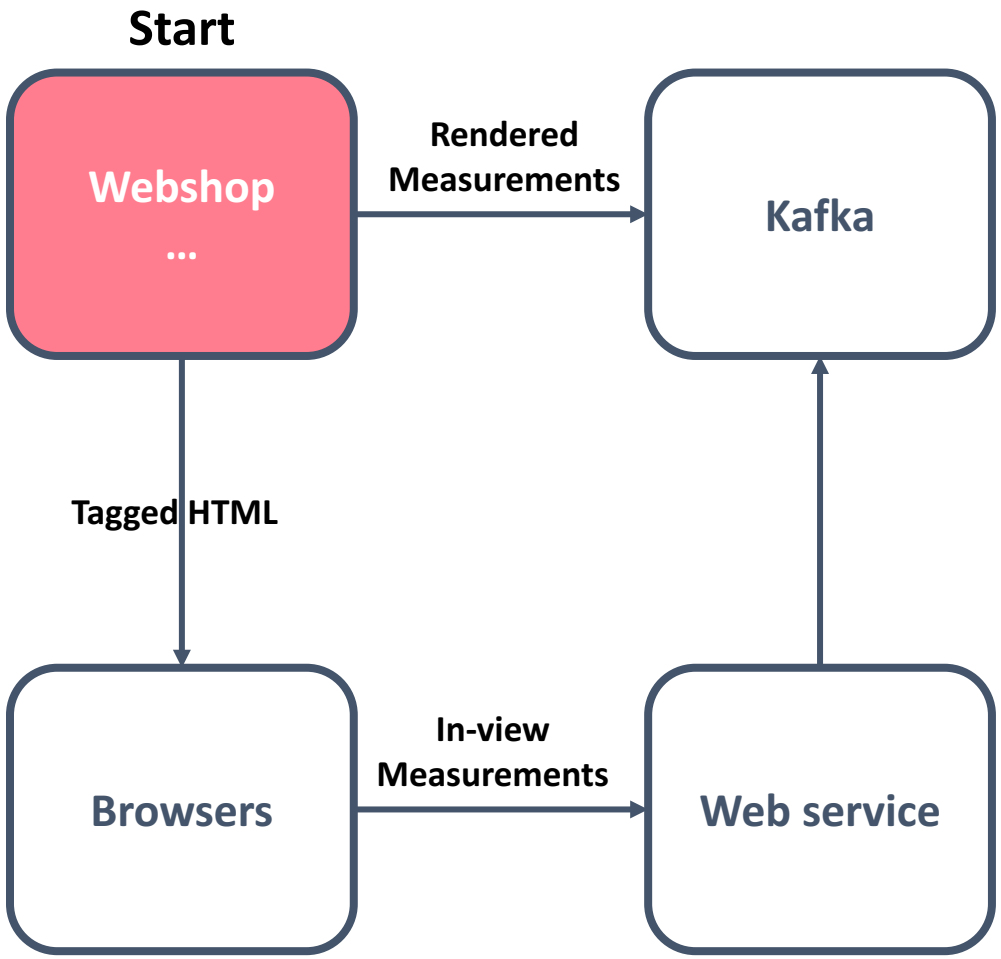

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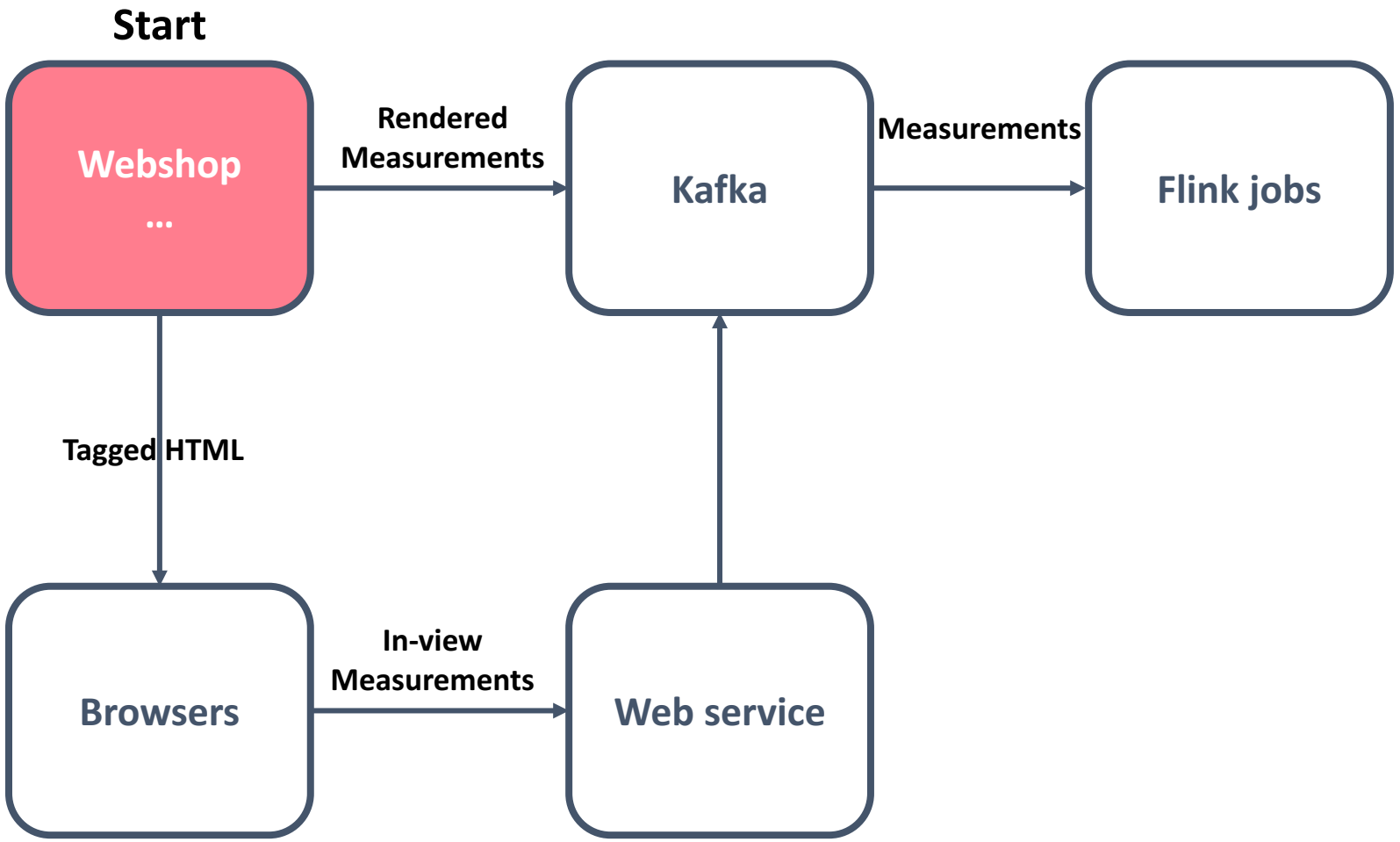
Design



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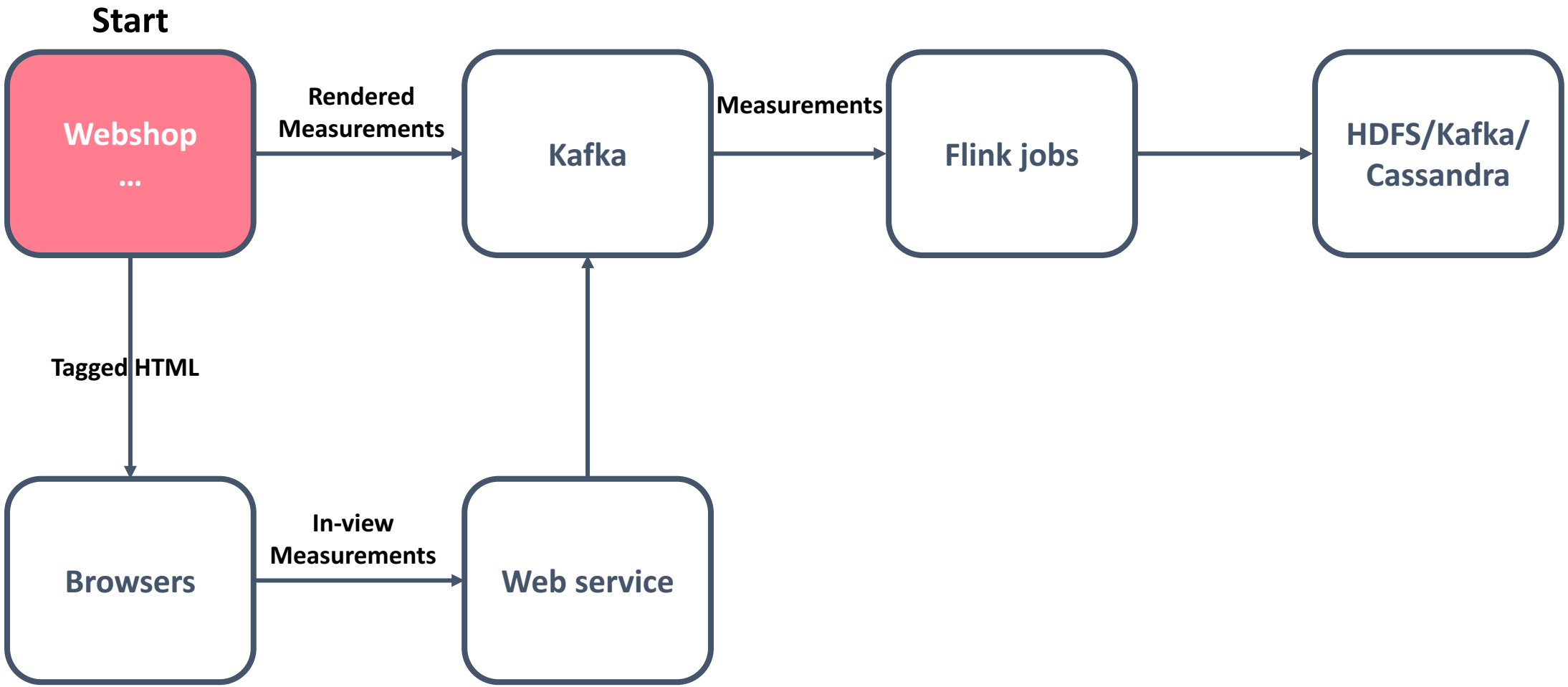
Design



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Data structure

Verkopen Zakelijk Cadeaubon Inloggen Bestelstatus Lijstjes Klantenservice

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Waar ben je naar op zoek? Alle artikelen Zoeken 2 Bestellen

Kies een categorie 1+1 gratis op Nivea Sun Korting op tuinsets & parasols Outlet Aanbiedingen

Gratis verzending vanaf 20 euro, gratis retourneren, bezorging waar en wanneer je wilt met Select artikelen*

BulkAlert

Winkelwagentje

Bestel nu en je bestelling wordt gratis verzonden!

The Elder Scrolls Online: Morrowind - Collector's Edition - Windows
Bethesda
Windows

Nog niet verschenen - reserveer een exemplaar Beschikbaar op 06-06-2017

Aantal 1

€ 99,99

Verplaats naar verlanglijstje
Verwijder

Hand Fidget Spinner Glow in the Dark - met hoogwaardige keramische lagers

Op voorraad. Voor 16:00 uur besteld, morgen in huis

Verkoper: **BestGadgets4U**

Aantal 1

€ 11,99

Verplaats naar verlanglijstje
Verwijder

Cadeaukaart- of kortingscode

Code invoeren

Totaal artikelen (2)	€ 111,98
Verzendkosten	Gratis
Totaal	€ 111,98

Verder naar bestellen

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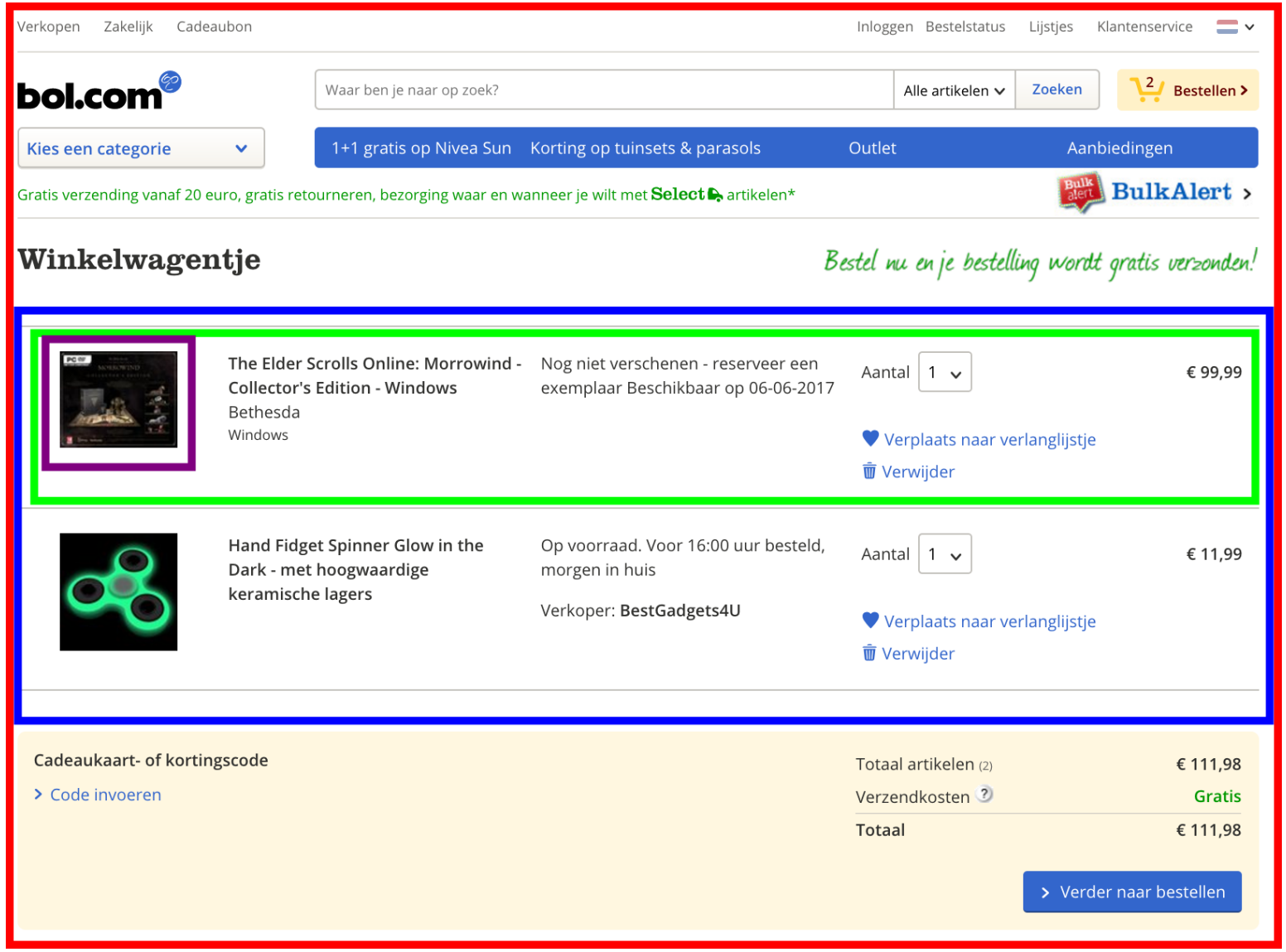
Data structure

Measurements

- Container — ID = a
- Group — ID = a.b
- Item — ID = a.b.c
- Hook — ID = a.b.c.ProductImage

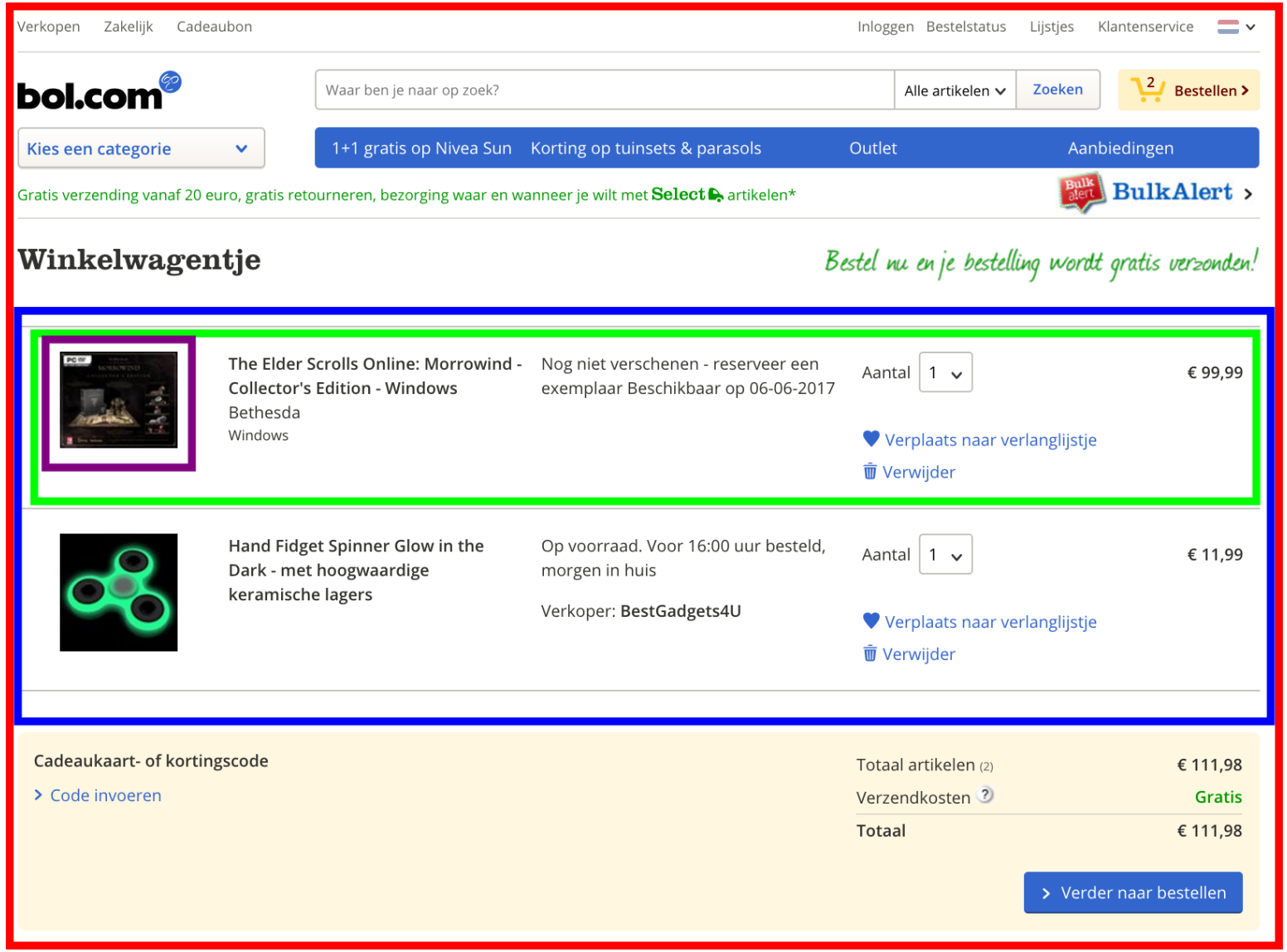


Data structure

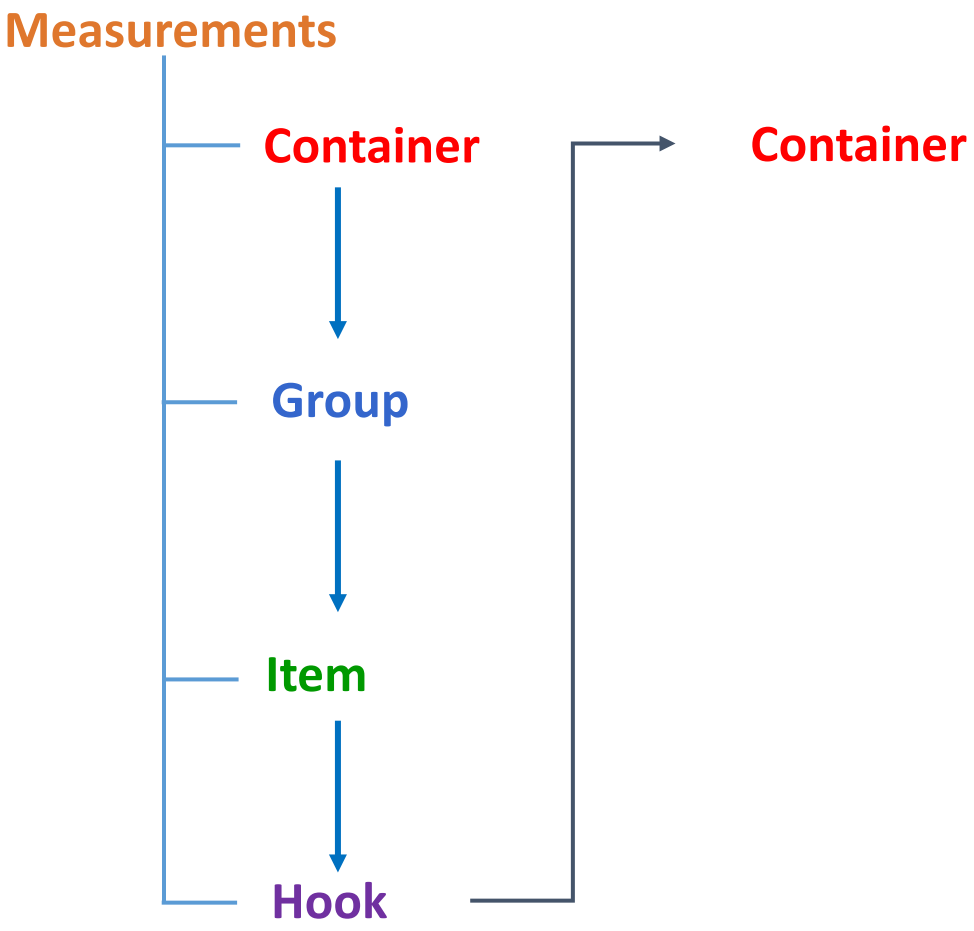
Measurements

- Container
- Group
- Item
- Hook

https://www.bol.com/nl/p/daten-is-meten/1001004010720589/?bltgh=ItemID.ProductImage



Data structure



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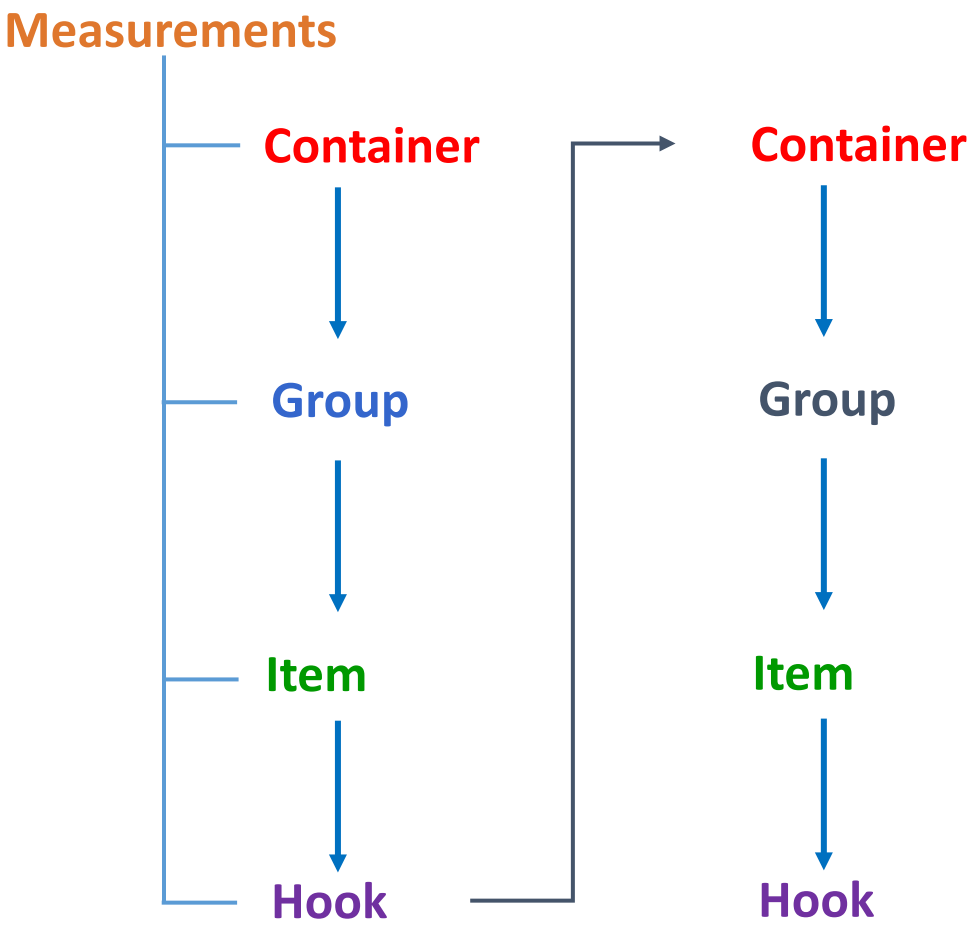

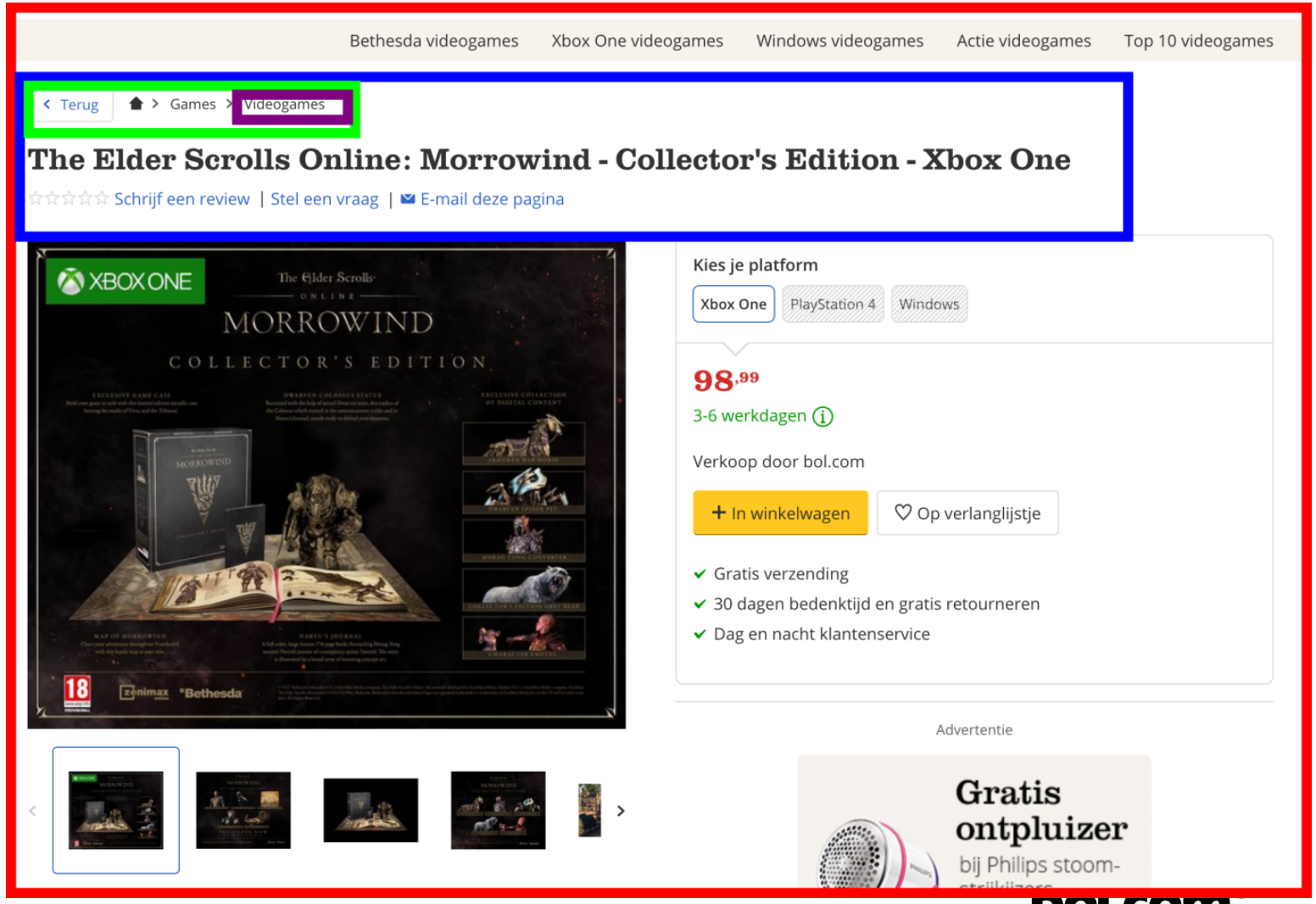

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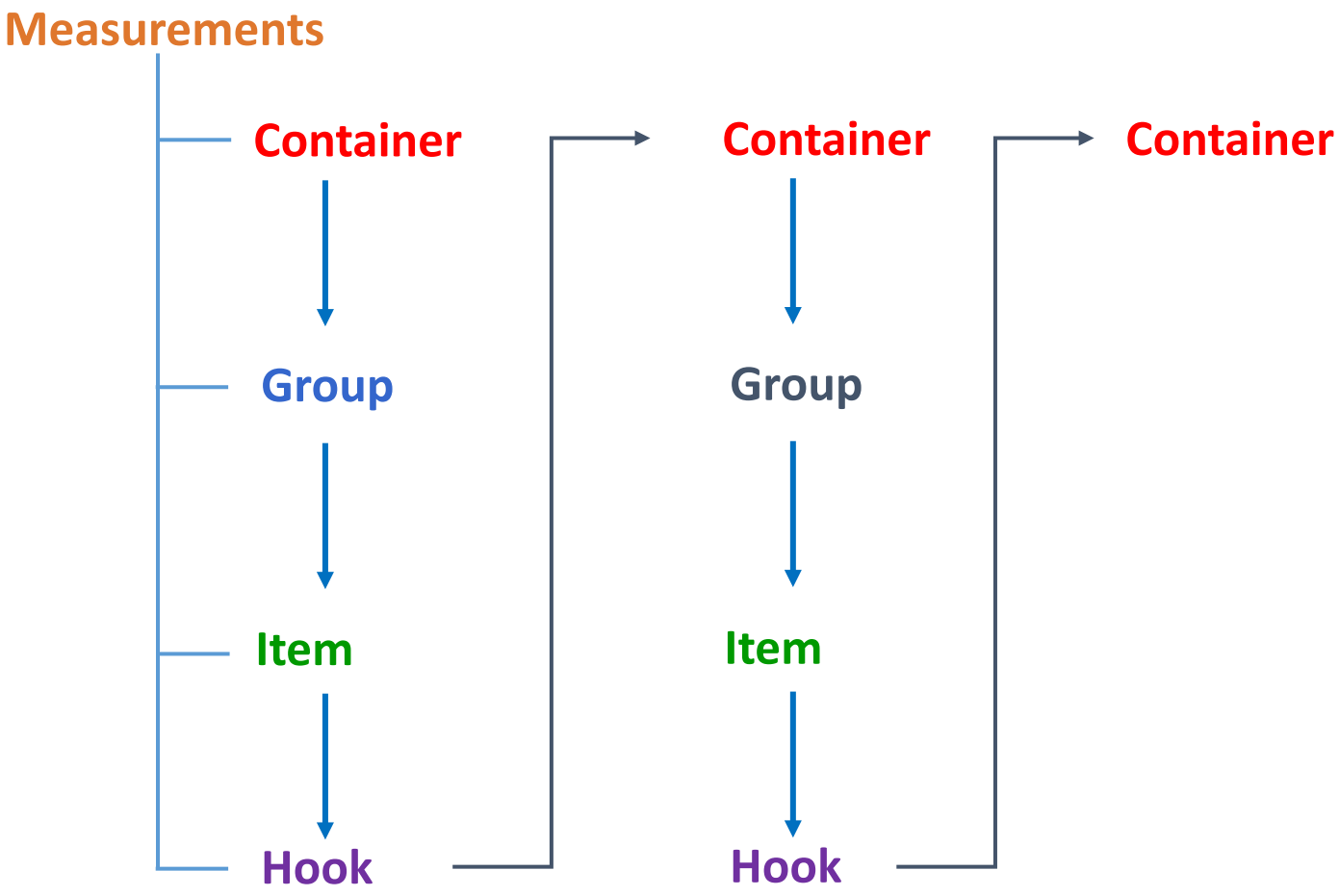

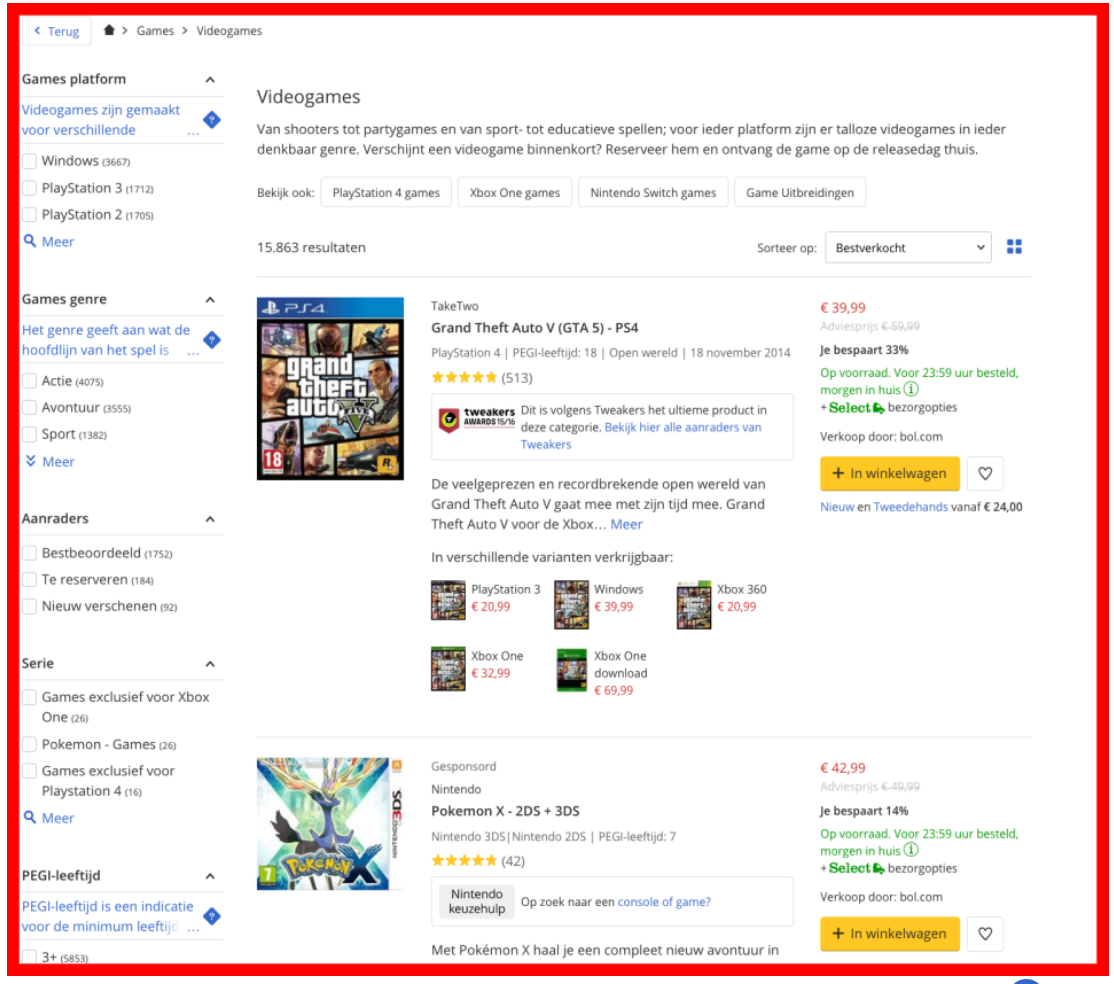

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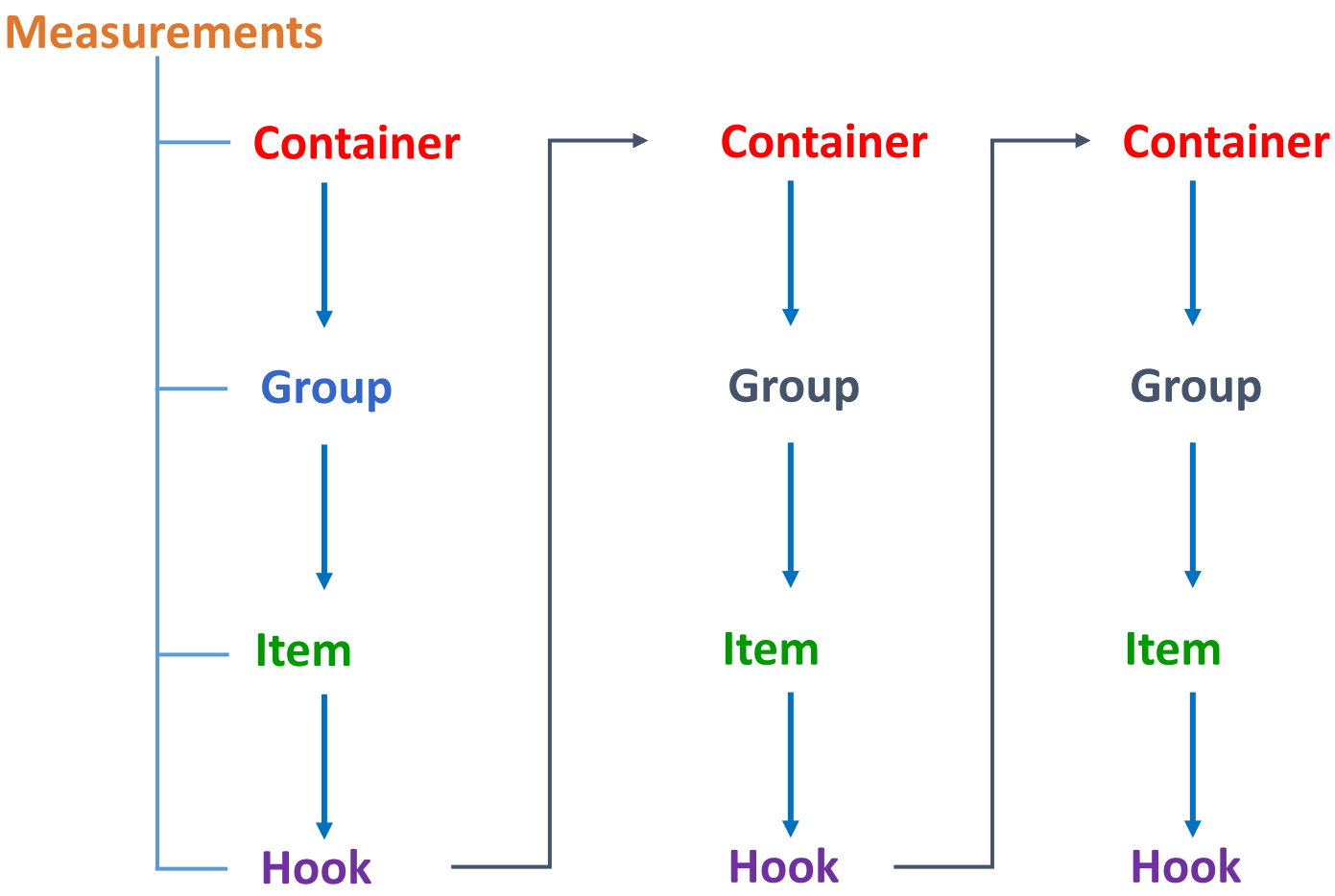
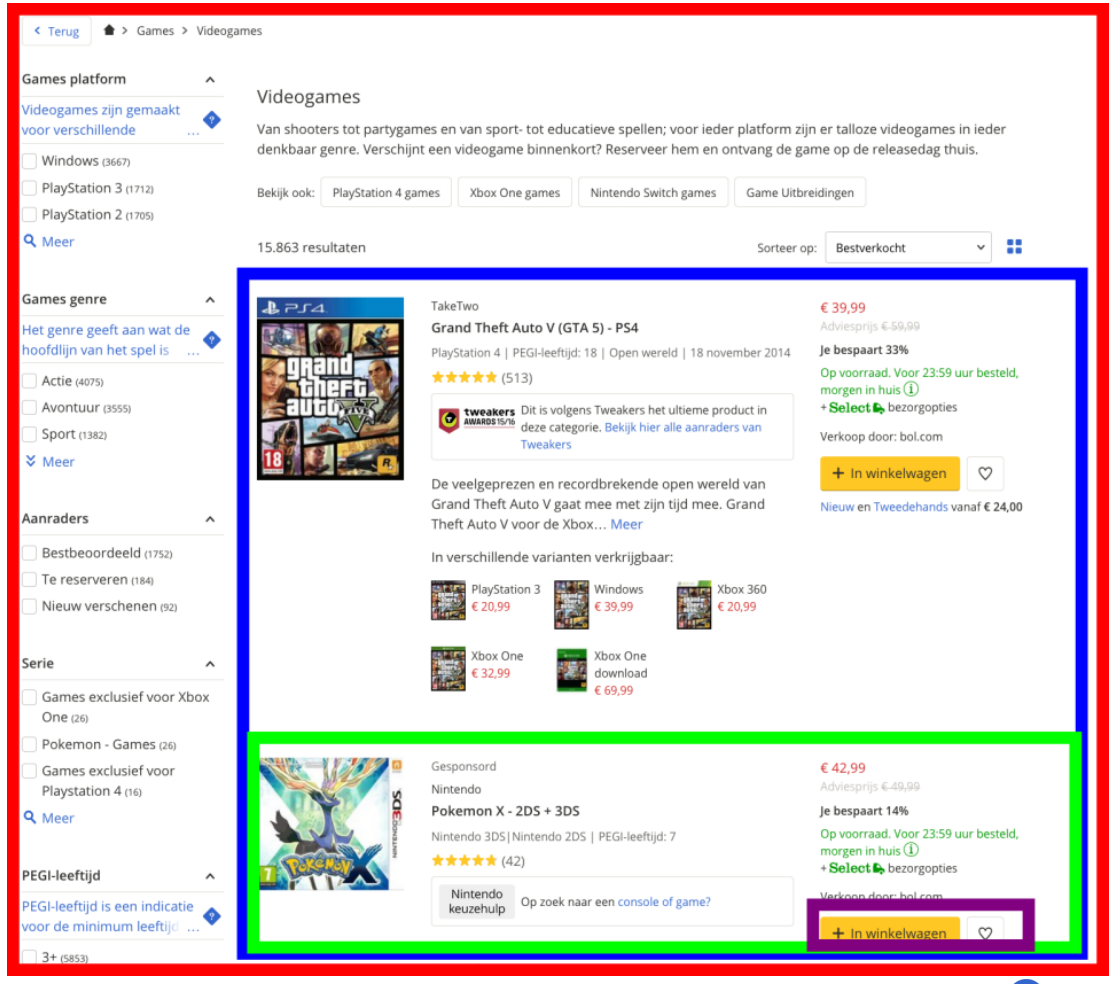
Data structure





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Data structure

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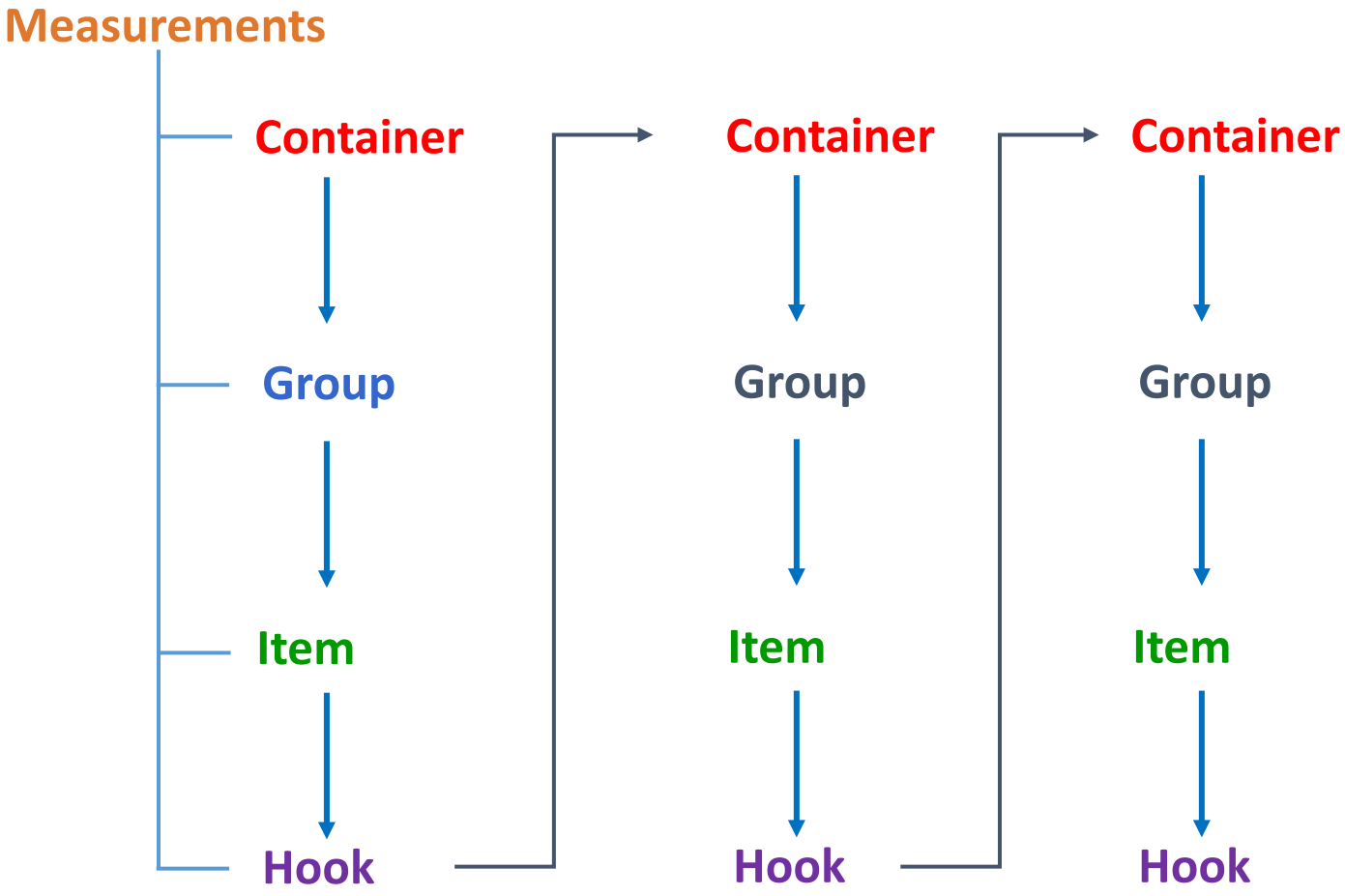

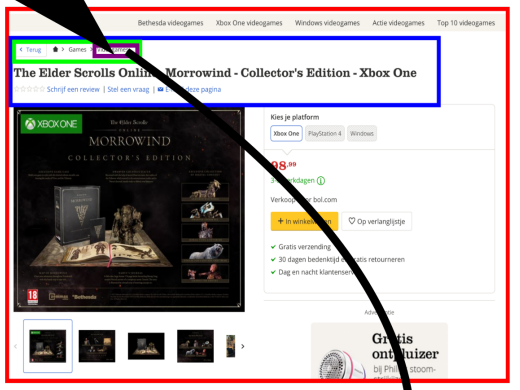

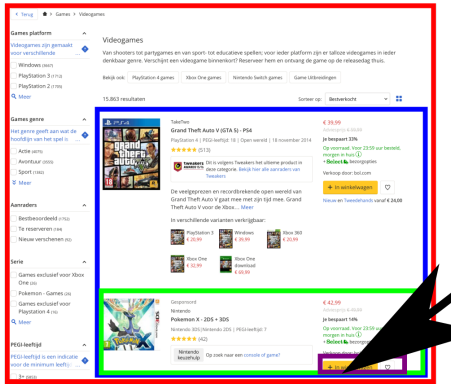

Customer's journey with cause and effect

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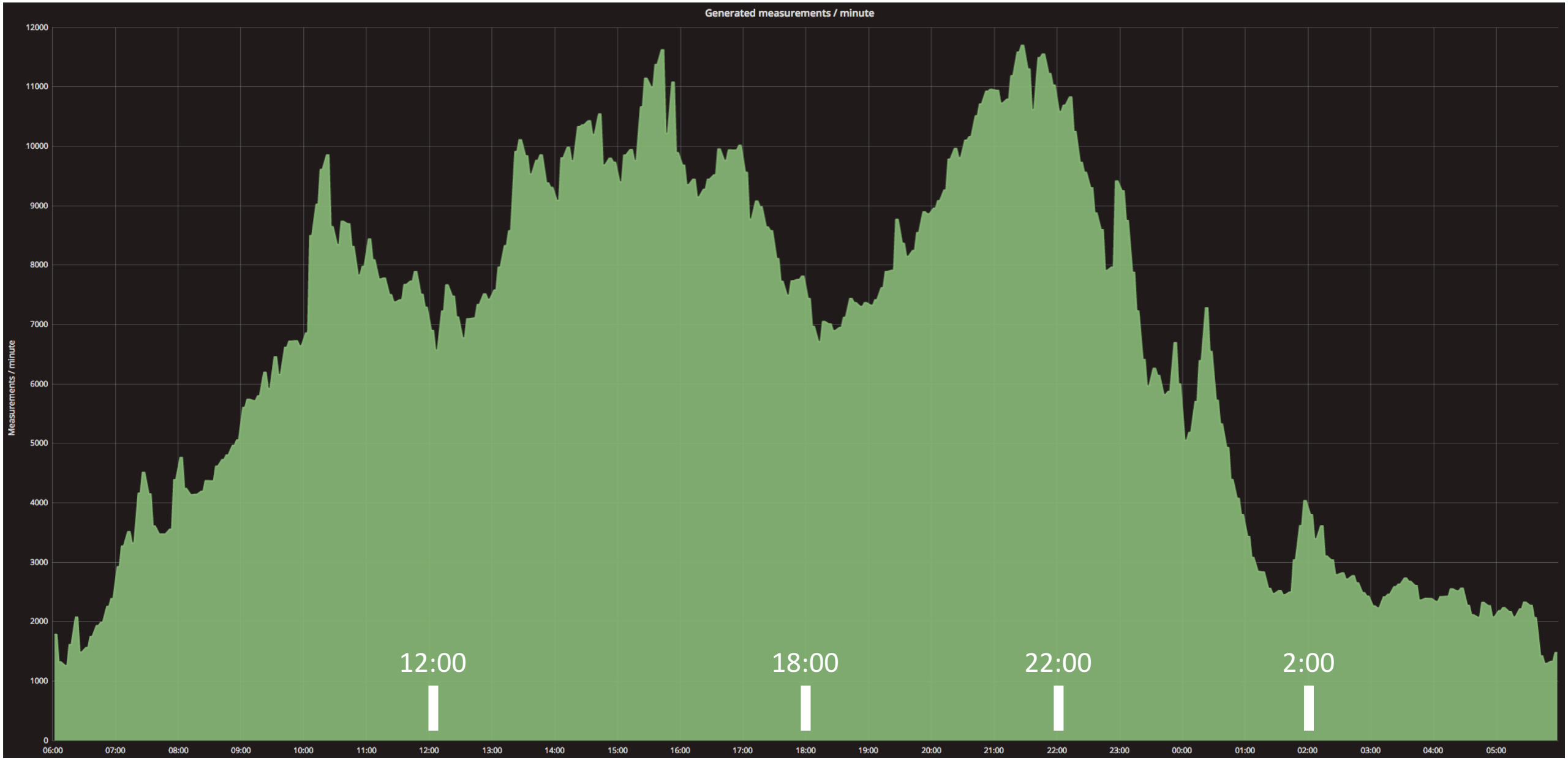
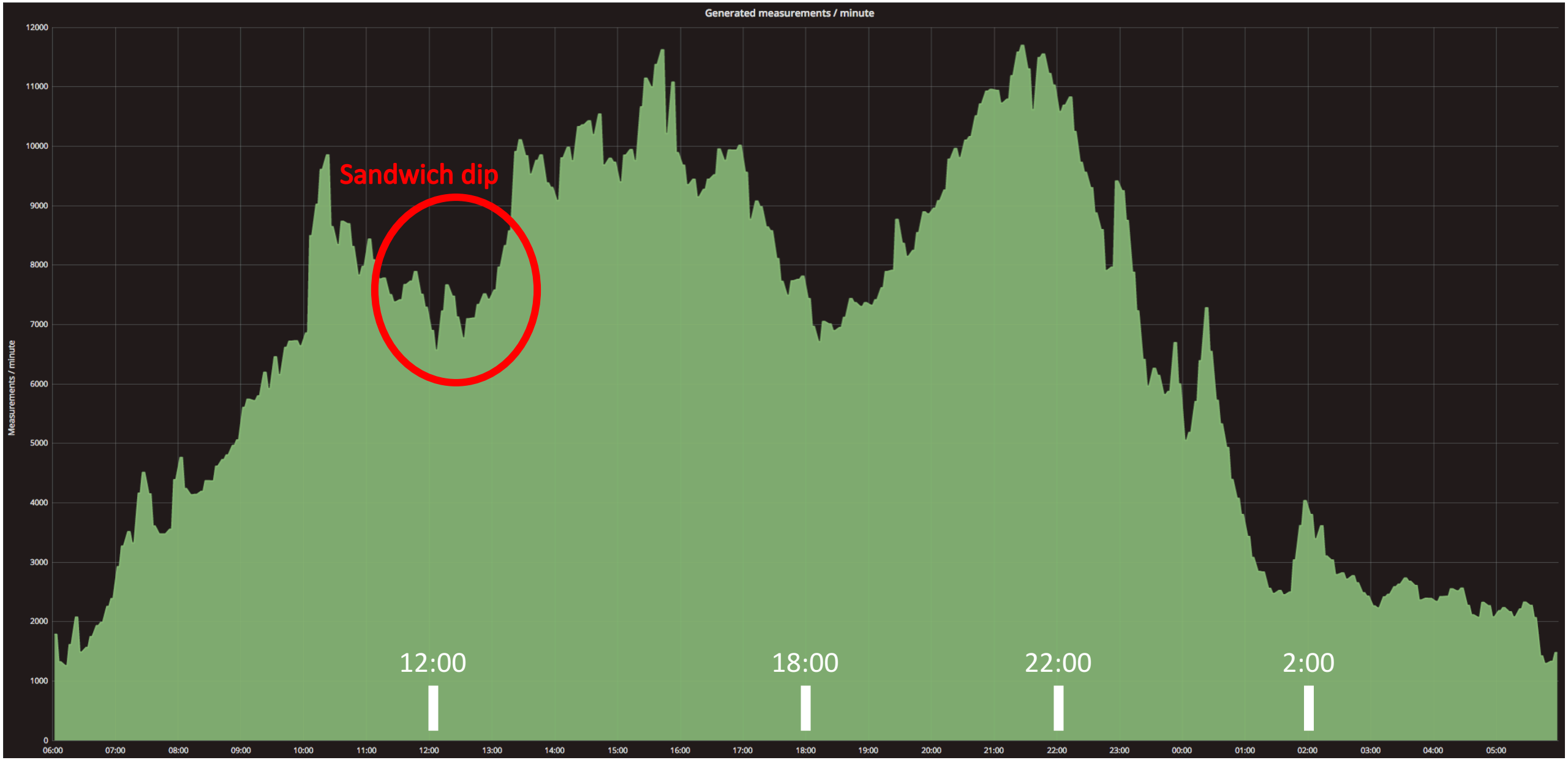
Production experiences

Production measurements



Production measurements



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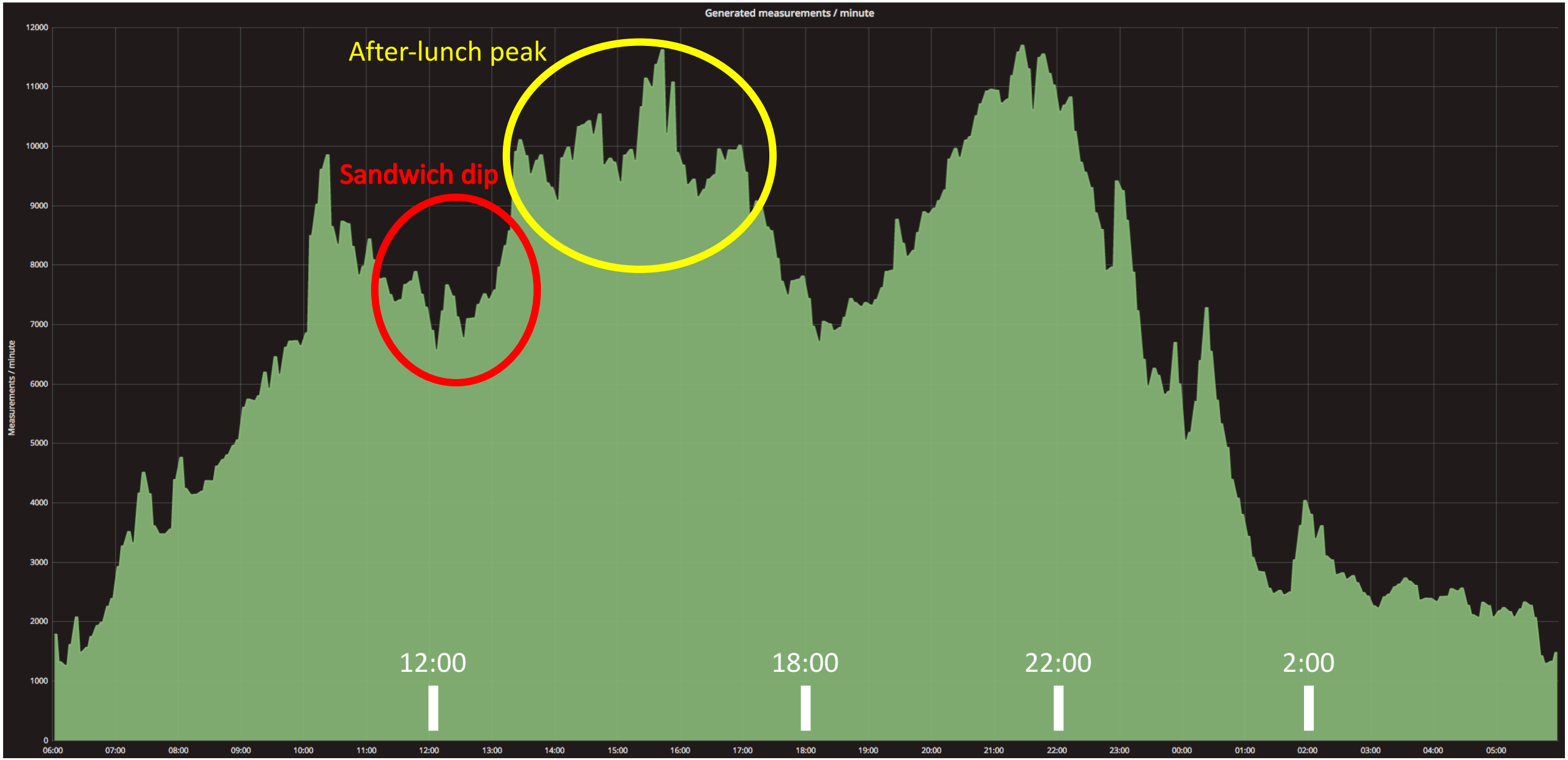

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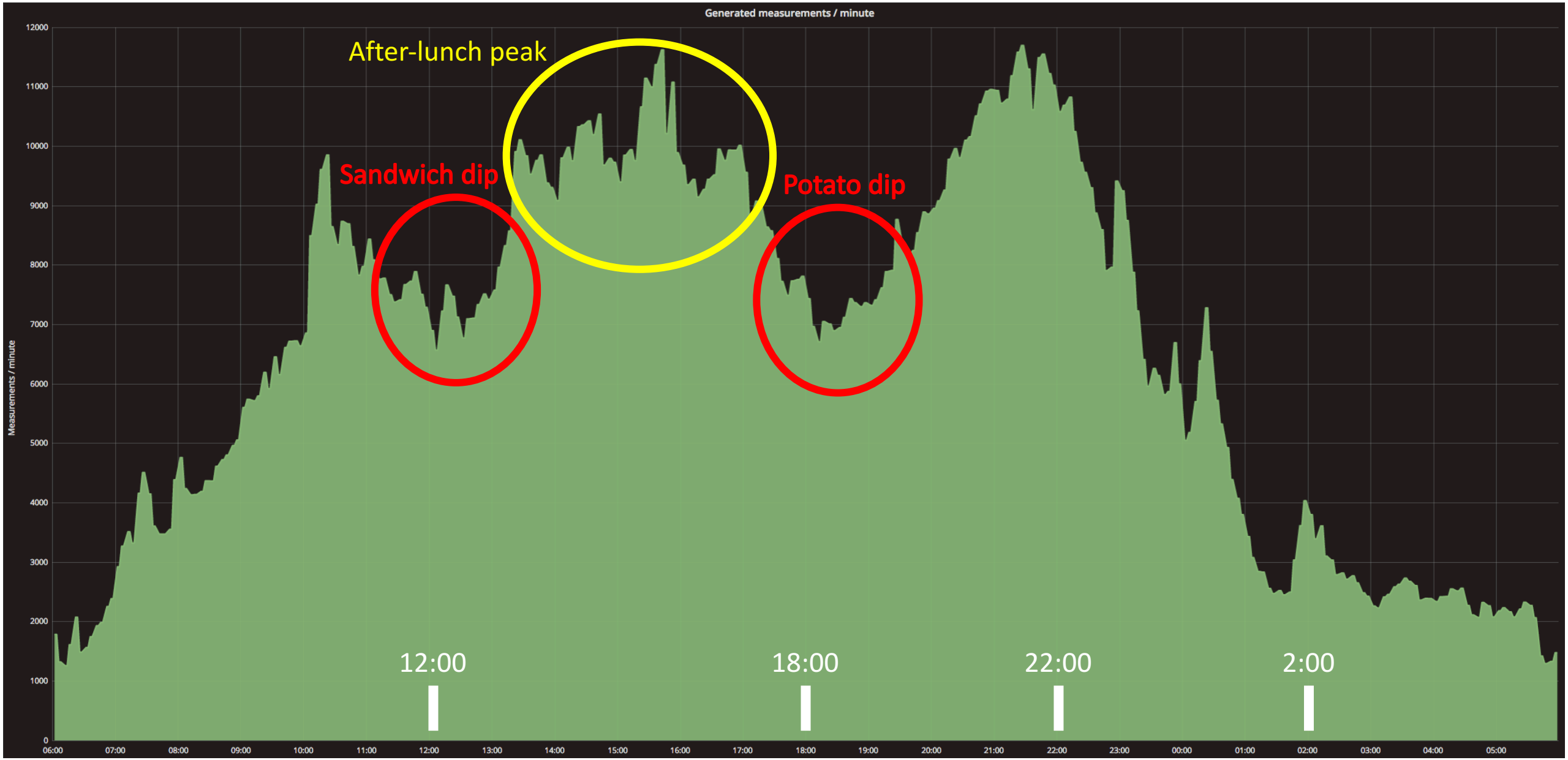

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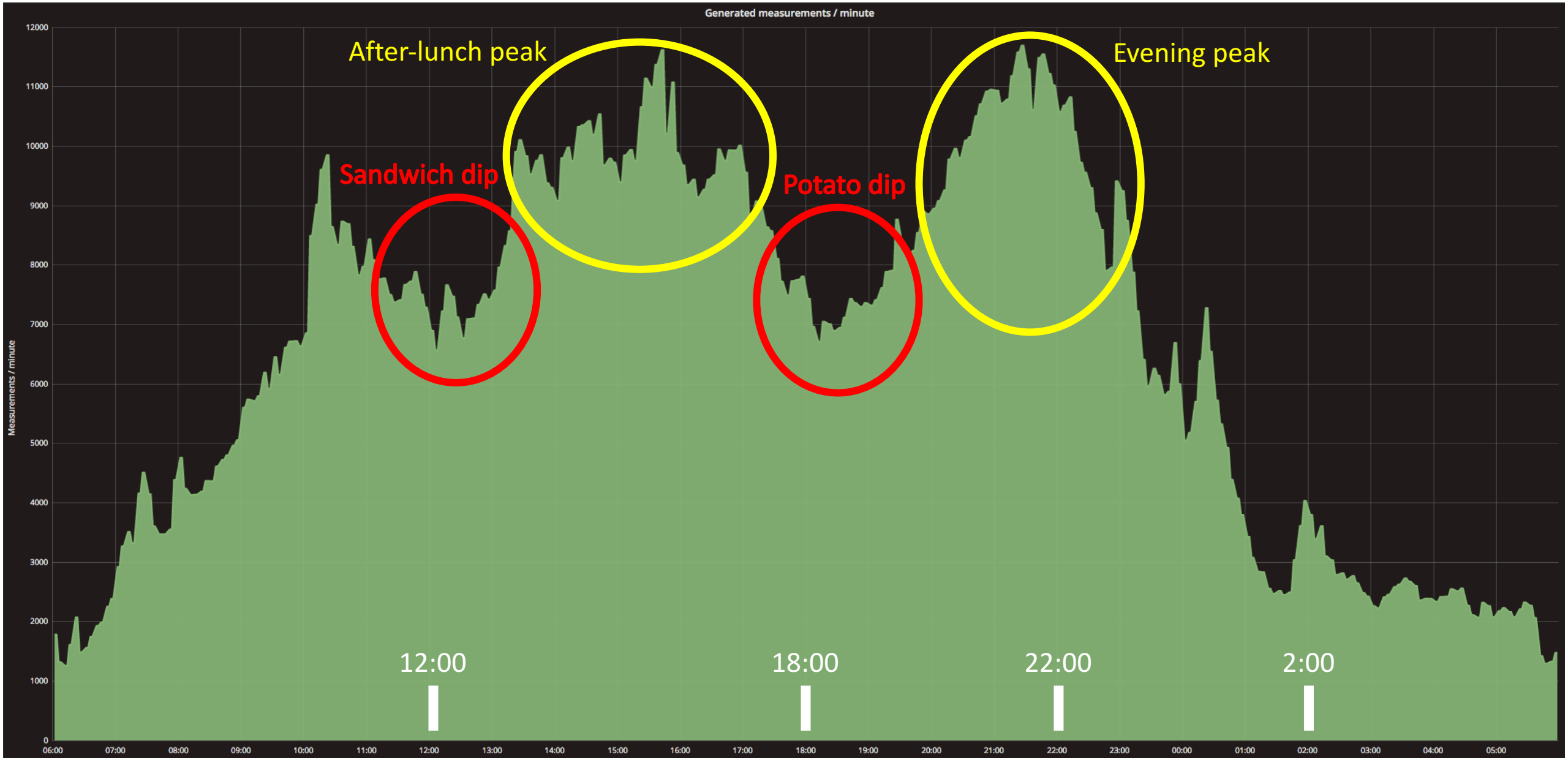

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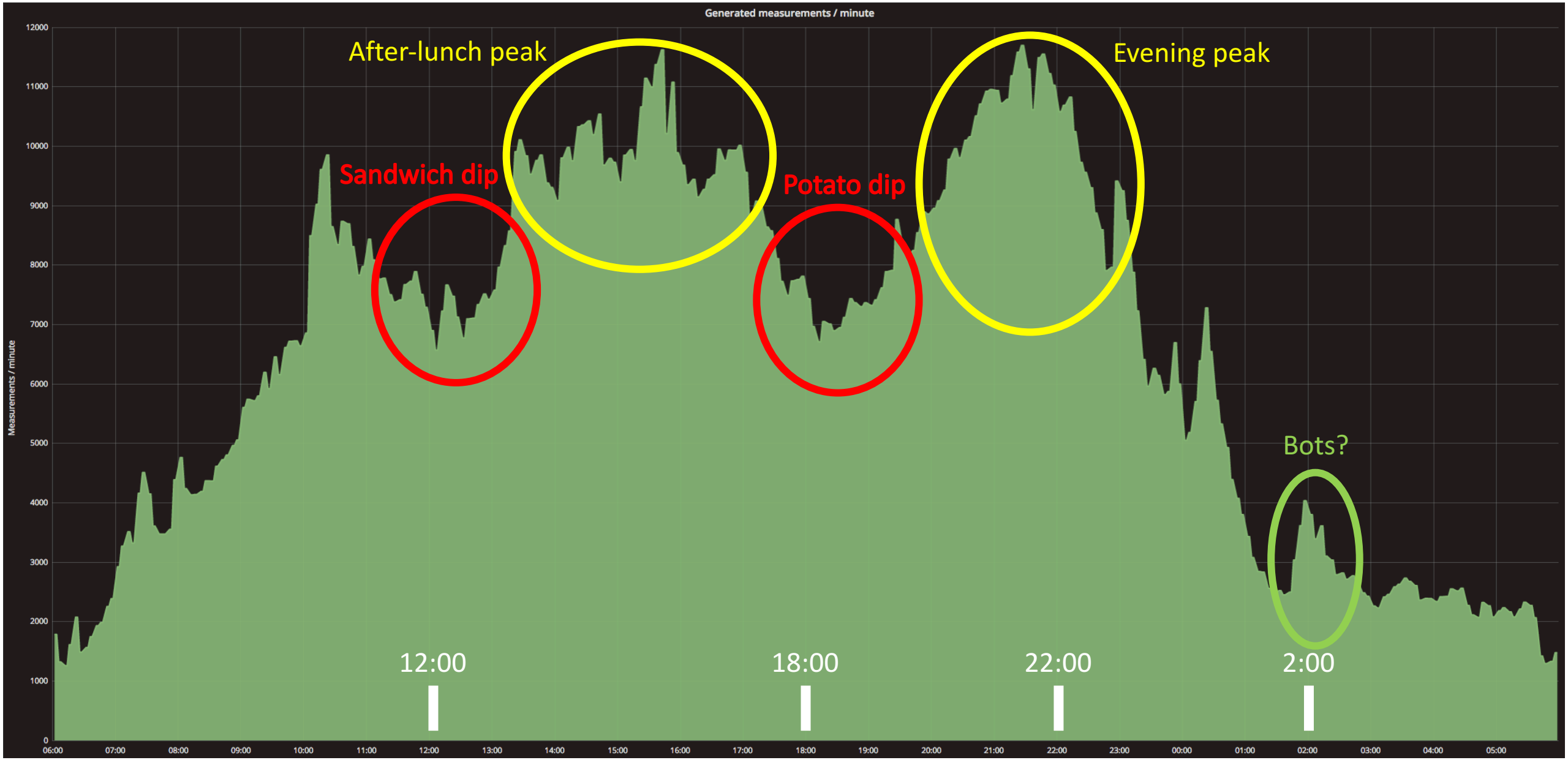
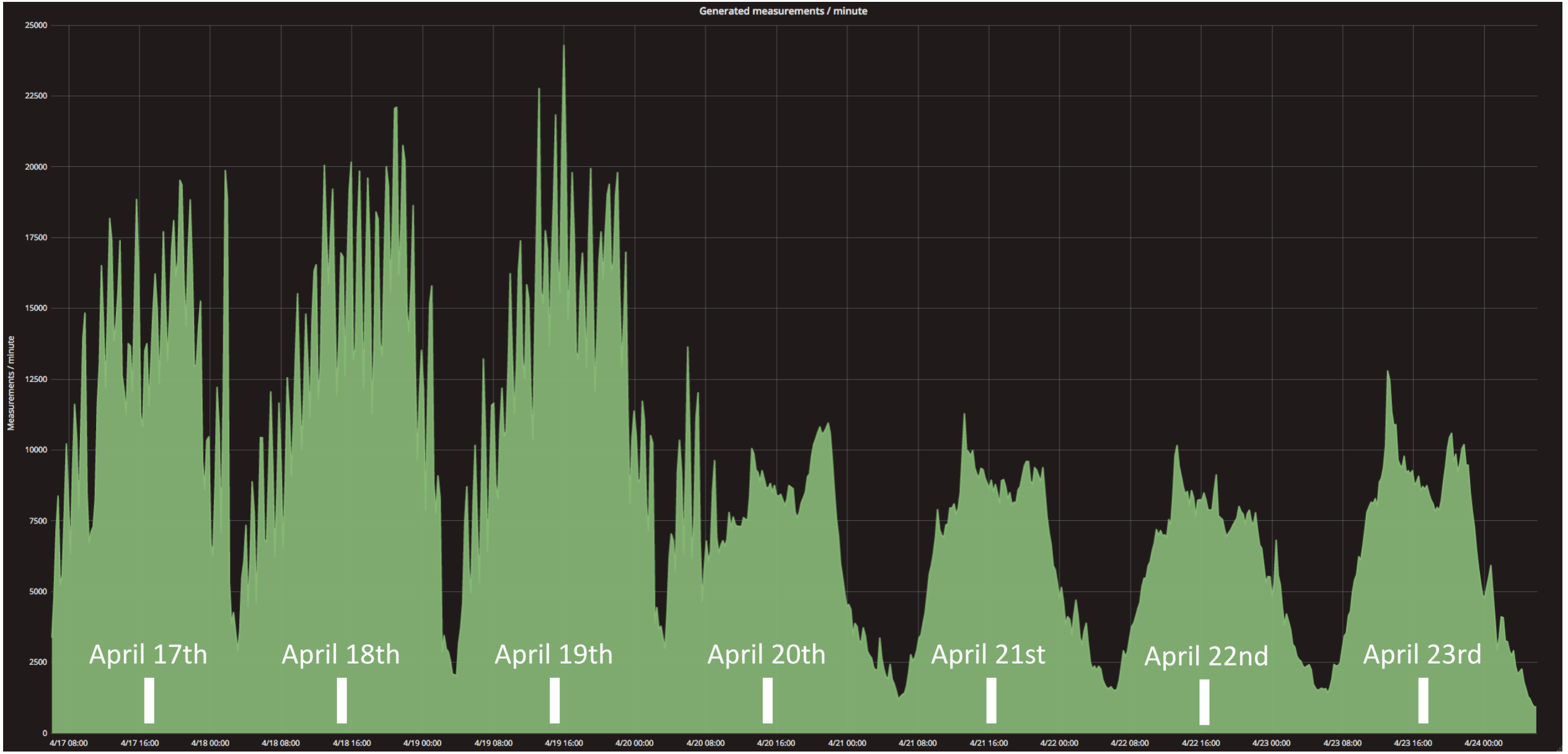
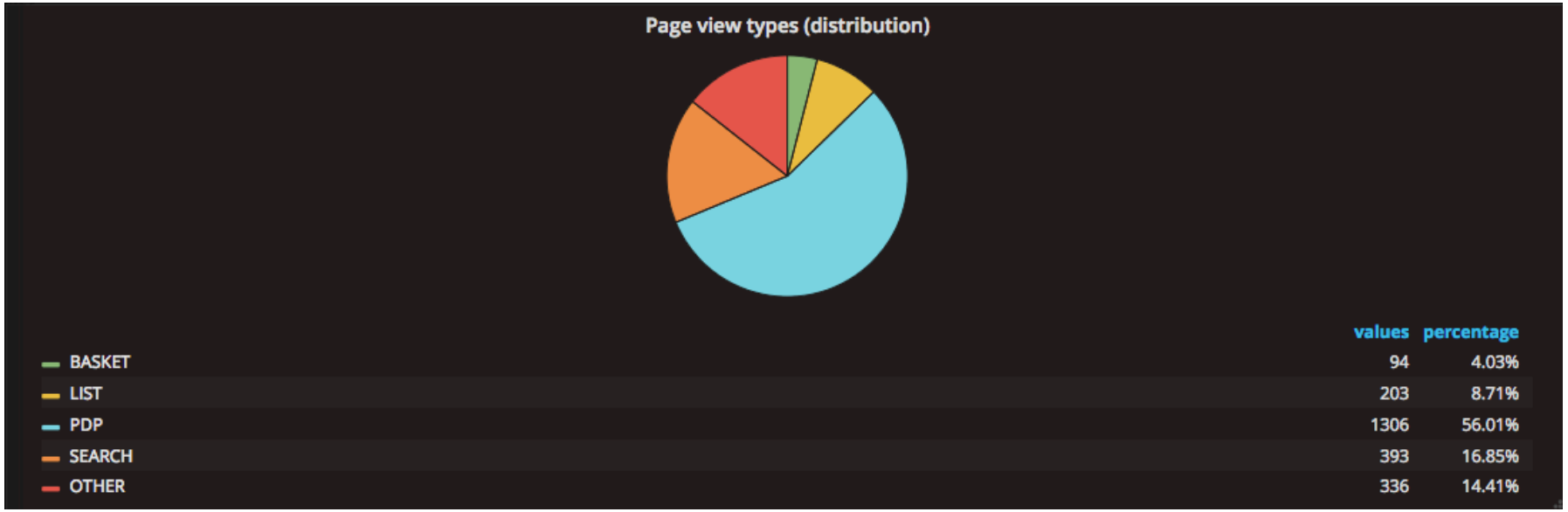


Filtering bot traffic



Some numbers

- Currently generated measurements/minute: ~15 500
- Expected peak load with website fully tagged: 6 000 000 measurements/minute
- Average message size: 500 bytes
- Most visited page: product page with 75% of views



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Kafka – cluster specs

- 3 nodes
  - 15x 126 GB disks
  - 3.6 TB RAM
  - 40 cores (2.3 GHz)

- First Kafka users at bol.com

Kafka – lessons learned

- Problem: disks spent a very long time on I/O operations

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Kafka – lessons learned

- Problem: disks spent a very long time on I/O operations

- Cause: property “flush.messages” set to 0

Kafka – lessons learned

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flush.mes-sages	This setting allows specifying an interval at which we will force an fsync of data written to the log. For example if this was set to 1 we would fsync after every message; if it were 5 we would fsync after every five messages. In general we recommend you not set this and use replication for durability and allow the operating system's background flush capabilities as it is more efficient. This setting can be overridden on a per-topic basis (see the per-topic configuration section).

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Kafka – lessons learned

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Kafka – lessons learned

- **Problem**: disks spent a very long time on I/O operations
- **Cause**: property “flush.messages” set to 0
- **Lesson**: do not change a default property without a concrete justification

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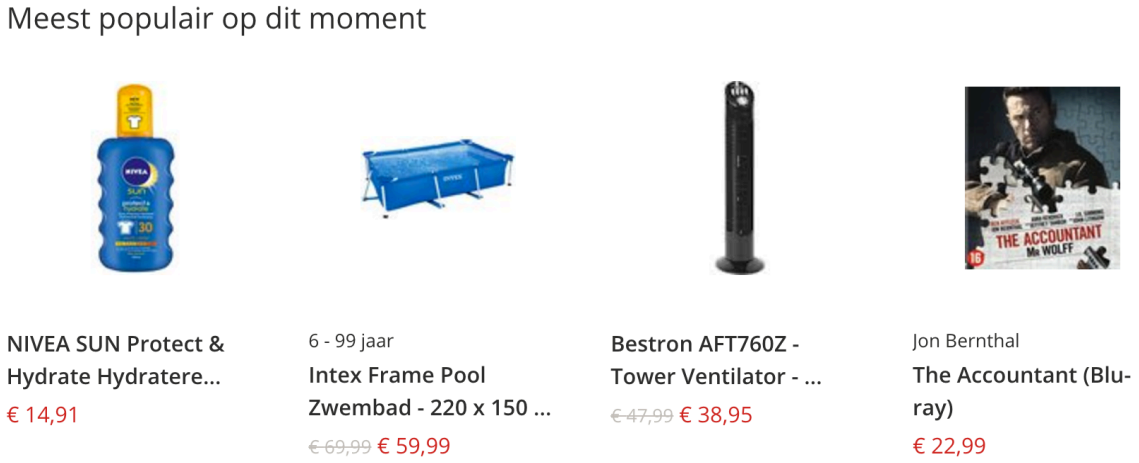
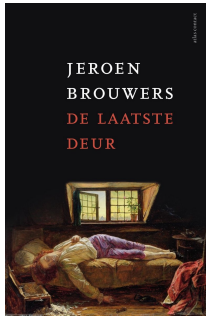
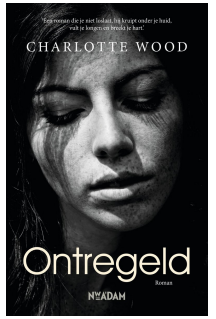
Applications – Real-time trending products

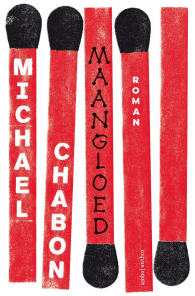
- Calculating products which are trending per 10 minute intervals compared to a reference period of 4 hours

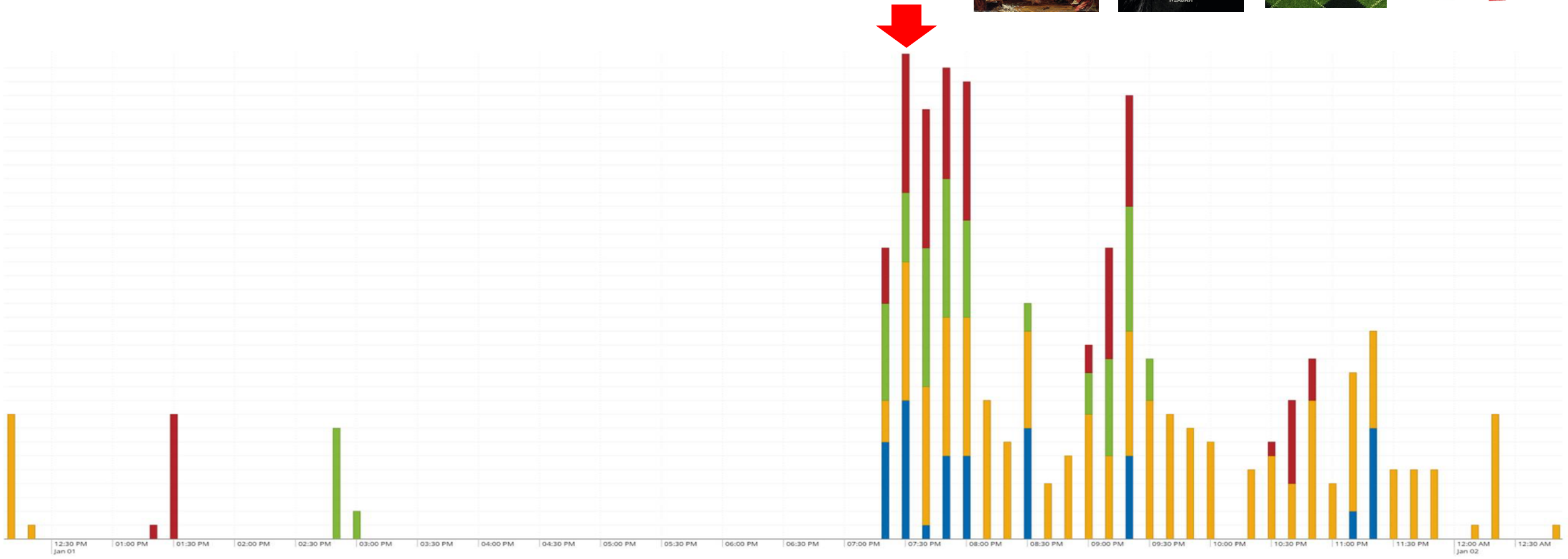


Real time trending









19:00 19:30

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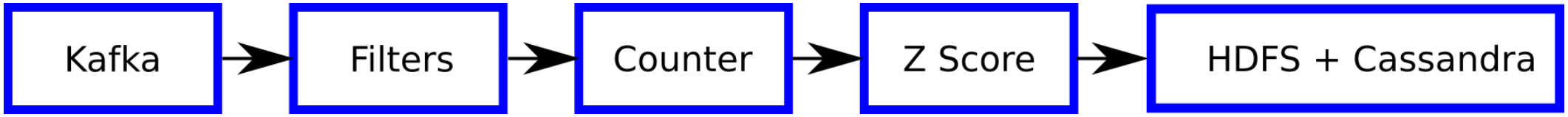
How do we do it?



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Persisting data

- Define Schema in: Apache AVRO
  - Nice schema language (IDL)
  - Generates Java classes
  - Supports schema evolution

- Persist in files: Apache Parquet
  - Compresses well
  - Great on read use cases
  - Write straight from Avro classes.
    - See o.a.parquet.avro.AvroParquetWriter

Persisting data

- Apache AVRO
  - Standard byte[] for the record.
  - Needs the original Schema on read
- What if the Schema changes?
  - Kafka keeps the events for weeks
- AVRO-1704
  - Serialize record to a “Message” byte[]
    - schema fingerprint (hash)
    - pluggable schema ‘database’

Future plans

Future plans

- Tag the entire webshop
- Tag the mobile app/ the seller dashboard
- Fully enable in-view measurements (currently at 1%)
- Provide tooling for working with the data
- Generate live reporting in real-time
- ...

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Thanks for listening

Questions?

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