# **Stijn Volders**

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Loves complex problems (that can be solved with software)



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#### **Distributed Events**

A case study from the trenches

#### Agenda

- ReTiBo
- The "Green List" concept
- Synchronization with events
- Scaling with HTTP
- Questions











ReTiBo (Registration, Ticketing, Board computer)

- User registration
- Travel information (trip duration, available connections,...)
- Traffic jams, deviations,...



#### 4500 driver consoles



#### 12000 validators

#### **Green List**



Synchronization



#### over 3G





- Inspired by ATOM
- Based on immutable events
- ASP.NET Web API
- nginx

- No power = no connection
- During (school) holidays: 5 to 20% not in use





```
{
     "links": [
     {
          "uri": "api/streams/greenlist/current",
          "Rel": "self"
     },
     {
          "uri": "api/streams/greenlist/2015/4/14?page=2",
          "Rel": "previous"
     ],
     "items": [{...}, {...}],
}
```

#### GET api/streams/greenlist/2015/4/14?page=2



GET api/streams/greenlist/2015/4/14?page=1







past

now



Why backwards?

when([SomePatternMatch], function(state, event) { return new state; });

(http://docs.geteventstore.com/introduction/event-sourcing-basics/)



# NGINX

Archived events

• Cache-Control: max-age=31363200 (somewhere near a year)

Current window

• Cache-Control: max-age=3000



Given

- Nothing is cached
- A 5 minute interval
- 16500 devices

198 000 connections / hour

198 000 database hits / hour



Given

- A 5 minute cache
- A 5 minute interval
- 16500 devices

6 connections

6 database hits

33 000 times less...







3G, remember?

HTTP to the rescue (again)

- ETags
- Cache validation
- Conditional requests

#### **Conditional requests**



Number time...

- 600kb payload for a page of 1000 items
- 16h of activity (6am 10pm)
- Sync every 5 minutes

Number time...

- 7.2 mb every hour (per device)
- 110 mb after 16 hours (per device)
- 1.8 TB for all devices each day



Number time... (conditional requests)

- Most greenlist events are created by night (batch)
- 1 request in the morning = almost always updated (HTTP 200 OK)
- 1 update per hour

Number time... (conditional requests)

- 600 kb every hour (per device)
- ~10 mb after 16 hours (per device)
- 165 GB for all devices each day

#### **Measure!**



Bandwidth conditional requests

updates/hour

# Wrapping it up

- Expose immutable events
- Start at the end and follow "previous"
- Replay the events chronologically
- Conditional requests



#### **Questions?**



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# Thank you!



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