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# Fairy Bench

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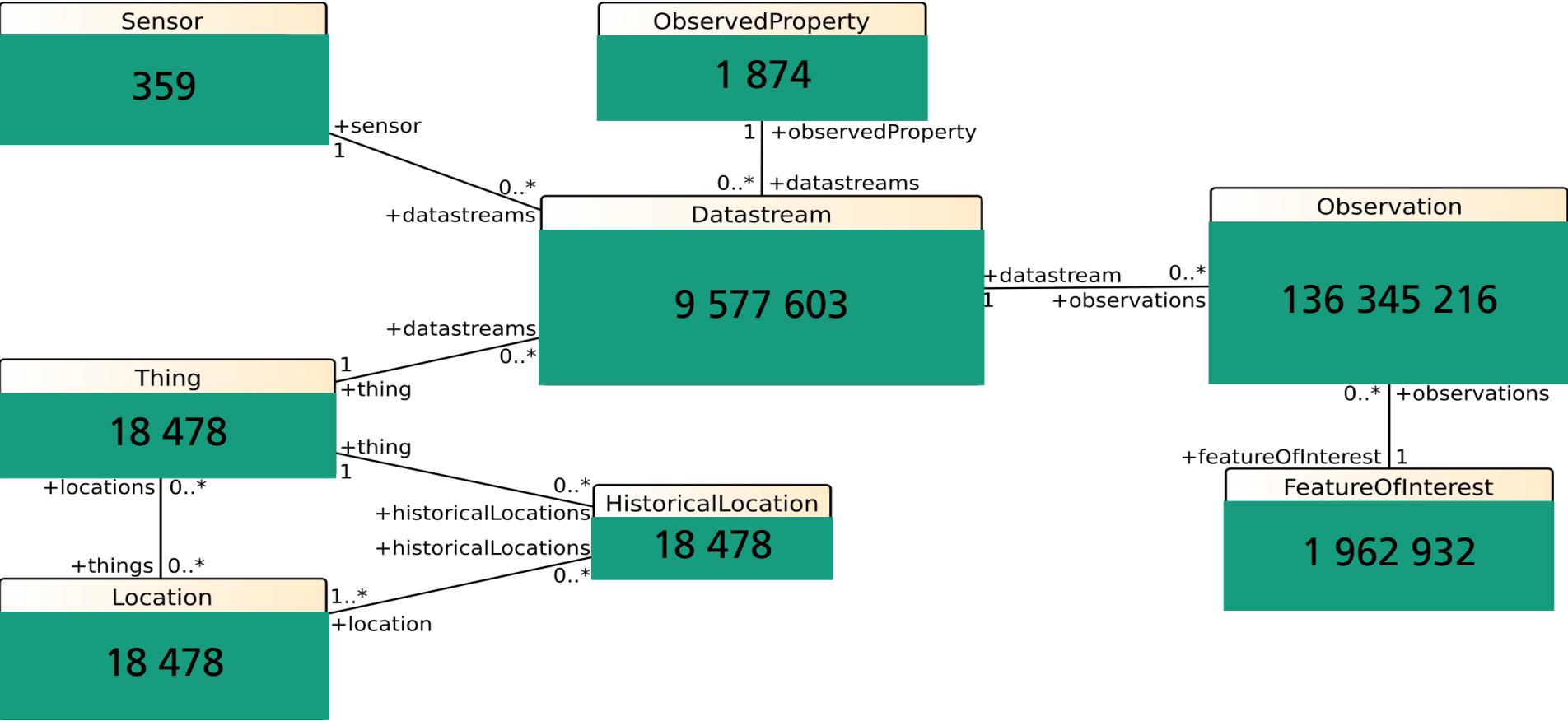
Dr. Hylke van der Schaaf  
Kathi Schleidt



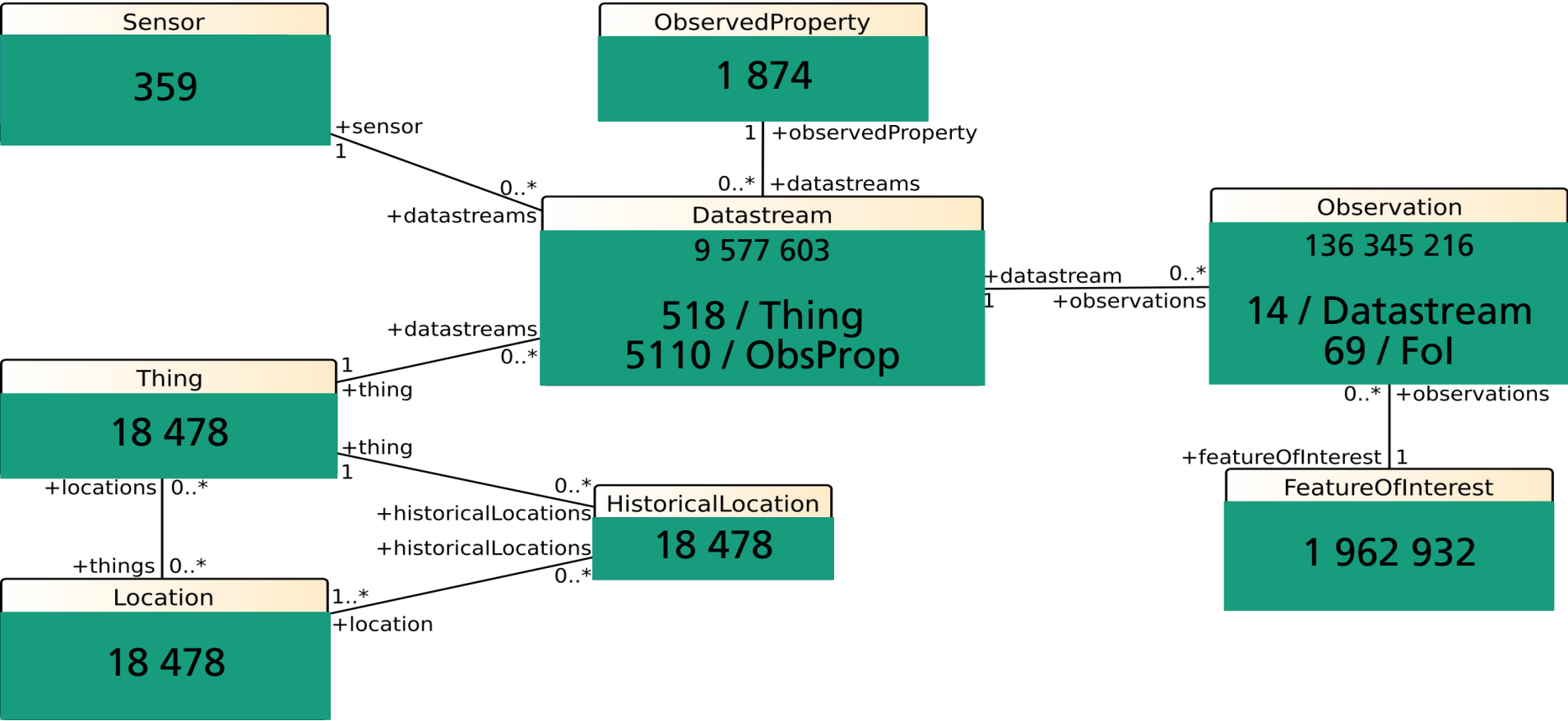
**Fraunhofer**  
IOSB

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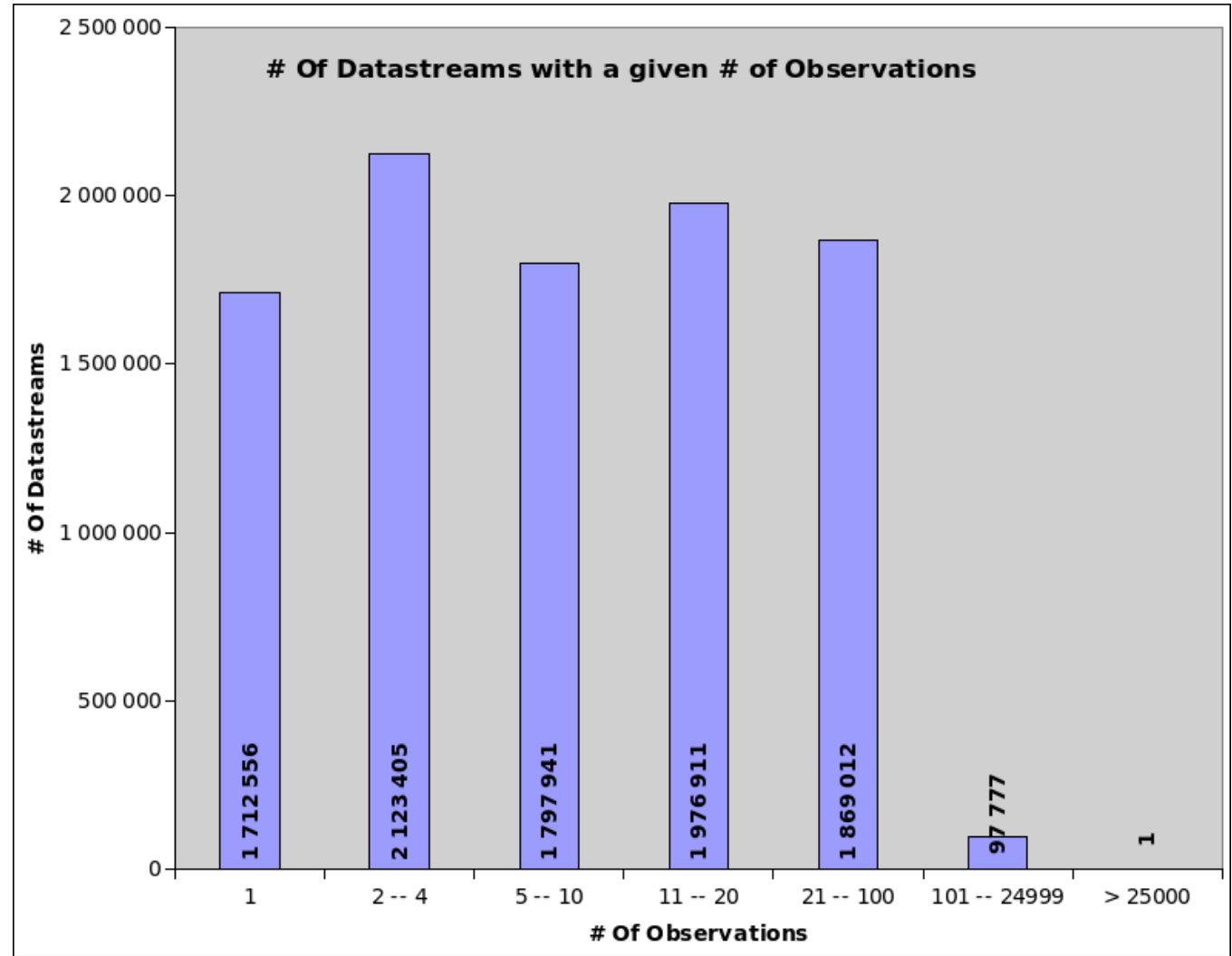
# Statistics



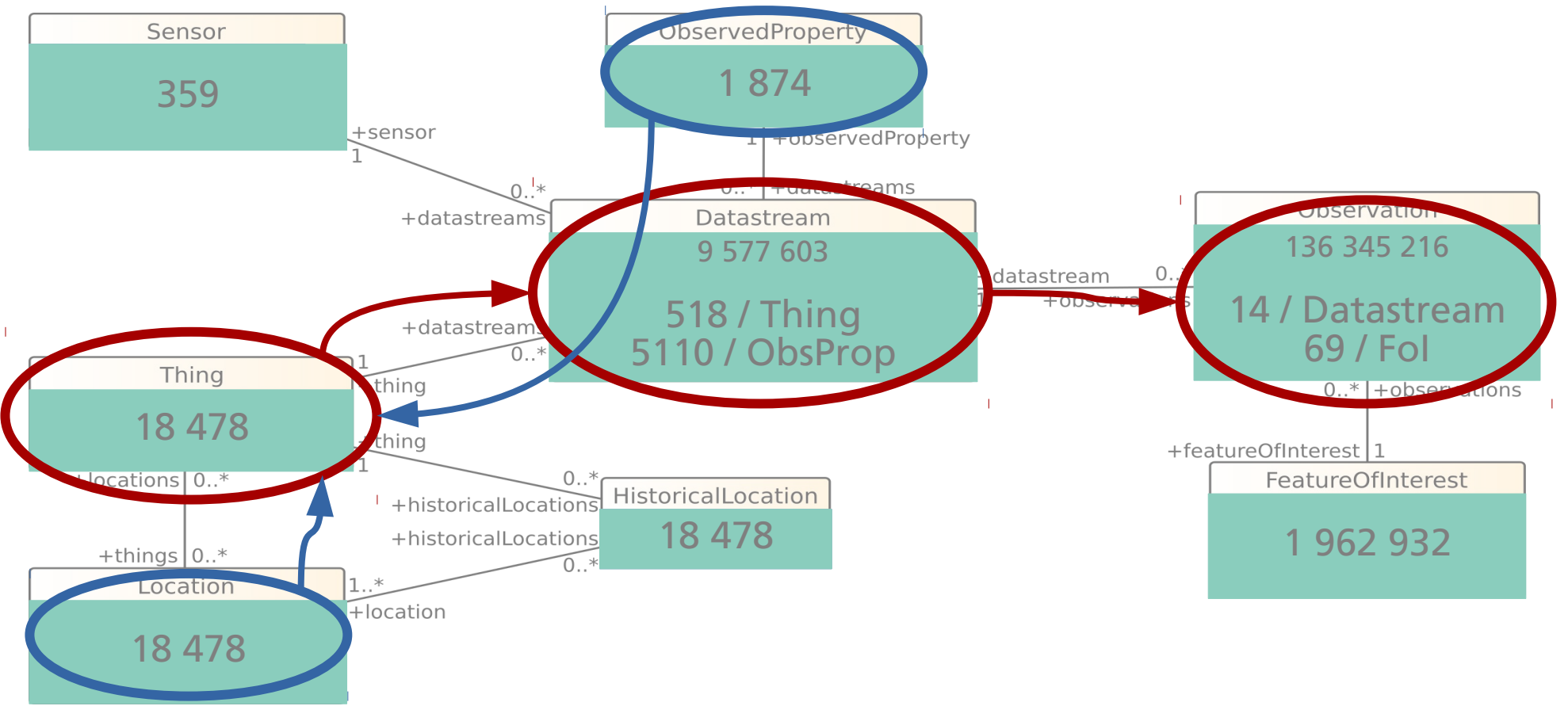
# Statistics



# Statistics



# Query Patterns



# VMs

## ■ FROST

- 2CPUs
- 4GB ram
- 8GB disk
- Tomcat 9, JDK 1.8

## ■ Database

- 2 CPUs
- 8GB ram
- 250GB disk (ssd)
- PostgreSQL 11.2

# Queries – Things

| Label   | Average |
|---|---------|
| Flat Things; No Filter  | 148     |
| Flat Things; No Filter; Select name,id                        | 45      |
| Flat Things; No Filter; Select name,id; Skip 10000            | 51      |
| Flat Things; Top; No Filter                                   | 47      |
| Flat Things; Top; No Filter; Count                            | 55      |
| Flat Things; Top; Filter DSTime;                              | 132117  |
| Flat Things; Top; Filter ObsTime;                             | --      |
| Flat Things; Top; Filter DSTime, 2DepId                       | 819     |
| Flat Things; Top; Filter DSTime, 2DepId; Count                | 869     |
| Flat Things; Top; Filter DSTime, 2DepId; Order StationCode    | 944     |
| Flat Things; Top; Filter DSTime, 1DepId, ResultCode;          | 3384    |
| Flat Things; Top; Filter DSTime, 2RivBasId;                   | 650     |
| Flat Things; Top; Filter DSTime, 2RivBasId; Order StationCode | 1565    |
| Flat Things; Top; Filter DSTime, 2StationCode                 | 313     |
| Flat Things; Top; Filter DSTime, 1ObsProp                     | 170     |
| Flat Things; Top; Filter DSTime, 1ObsProp; Select             | 149     |
| Flat Things; Top; Filter DSTime, 1ObsProp; Select; Count      | 208     |
| Flat Things; Top; Filter DSTime, 2DepId, 1ObsPropId           | 760     |
| Flat Things; Top; Filter DSTime, 2DepId, 1ObsPropId; Count    | 998     |
| Flat Things; Top; Filter 1StationCode;                        | 405     |
| Flat Things; Top; Filter BBox                                 | 93      |
| Flat Things; Top; Filter BBox; Count                          | 90      |

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| Flat Things; Top; Filter BBox; Count                          | 90      |

Reduced json size → Faster



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| Flat Things; Top; Filter DSTime, 2DepId, 1ObsPropId; Count    | 998     |
| Flat Things; Top; Filter 1StationCode;                        | 405     |
| Flat Things; Top; Filter BBox                                 | 93      |
| Flat Things; Top; Filter BBox; Count                          | 90      |

Filtering *all* Things *only* on Observations is very slow

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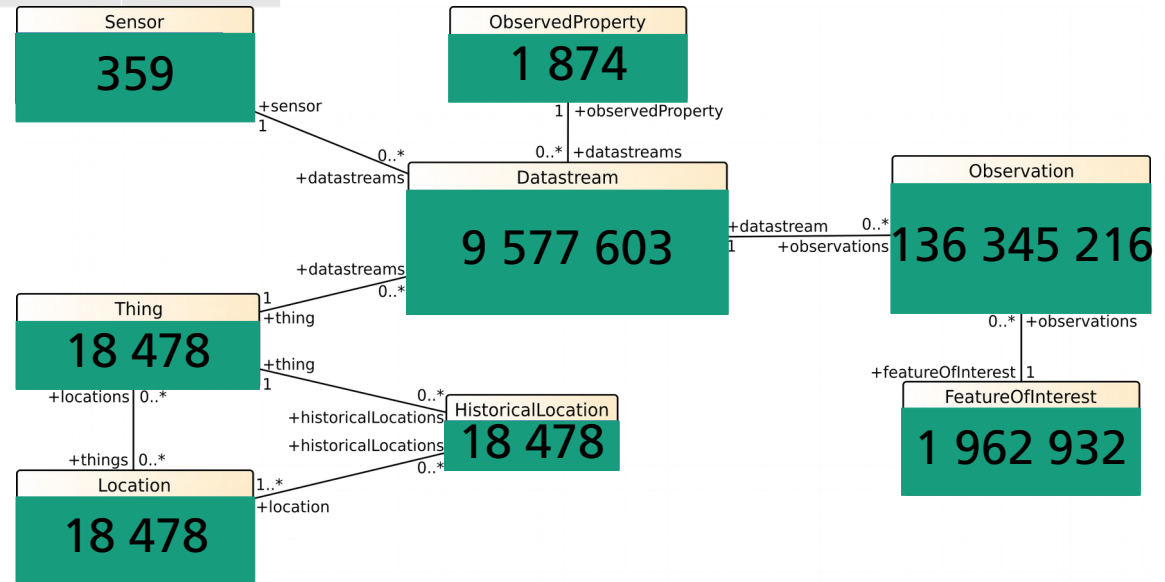
Adding any other filter for Things makes a big difference

Locations have a geo-index

# Queries – ObservedProperties & Features

| Label   | Average |
|---|---------|
| Flat ObservedProperties; Filter ThingId         | 42      |
| Flat ObservedProperties; Filter ThingName       | 51      |
| Flat ObservedProperties; Filter 1StationCode    | 223     |
| Flat ObservedProperties; Filter ThingId; Select | 44      |
| Flat Features; Filter ThingId                   | 104     |
| Flat Features; Filter ThingName                 | 107     |
| Flat Features; Filter 1StationCode              | 3053    |
| Flat Features; Filter ThingId; Select           | 104     |

Index on the Thing side not that important, but json parsing is expensive



# Queries – Observations

| Label  | Average |
|--|---------|
| Flat Observations; Filter 1StationCode, 1ObsProp                         | 302     |
| Datastreams+Observations; Filter 1StationCode, 1ObsProp                  | 424     |
| Datastreams+Observations; Filter 1ThingId, 1ObsProp                      | 59      |
| Datastreams+Observations; Filter 1StationCode, 1ObsProp; Select          | 424     |
| Datastreams+Observations; Filter 1StationCode, 1ObsProp, (1Phentime)     | 397     |
| Datastreams+Observations; Filter 1StationCode, 1ObsProp, (1YearPhentime) | 362     |

# Optimisation Potential

## ■ FROST-Internals

- Storing JSON in JsonB columns (GH Issue #12)
- Generate subqueries using SQL EXISTS instead of JOINS (GH Issue #11)

## ■ Database

- Indices for the most used filters  
(can also be on JSON)

## ■ Queries to the System

- StationCode → Thing@iot.id, then use the @iot.id