HSR
HOCHSCHULE FÜR TECHNIK
RAPPERSWIL
FHO Fachhochschule Ostschweiz

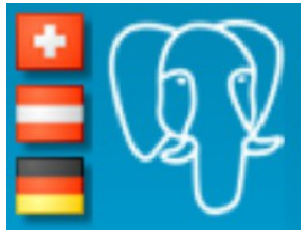
Point Cloud - Erfahrungen mit PostgreSQL und Big Data

8. November 2013

Prof. Stefan Keller

PointCloud - Postgres Extension! (1.11.13 Zoo Rapperswil)

Pointcloud Extension

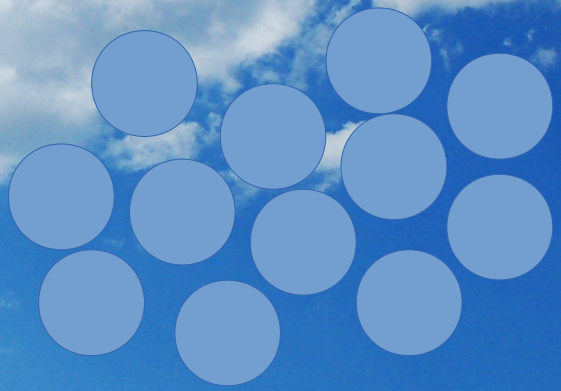


- PostgreSQL extension for storing point cloud data
- https://github.com/pramsey/pointcloud

- Datentypen und Funktionen

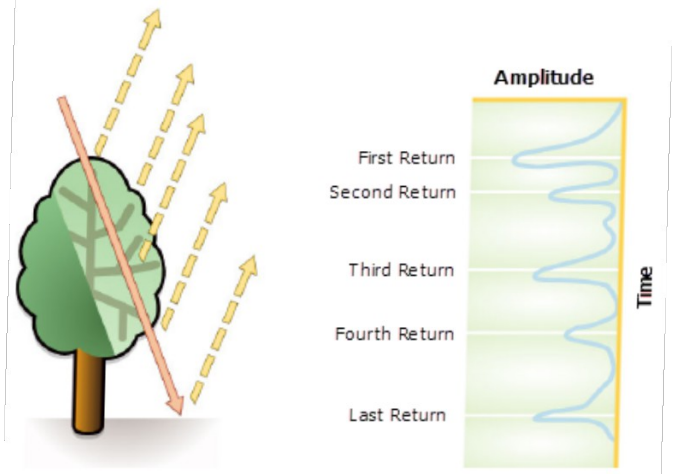
- Hintergrund
  - Von Paul Ramsey 2013, boundlessgeo.com
  - >5 Monate Entwicklungszeit
  - Finanziert von Natural Resources Canada

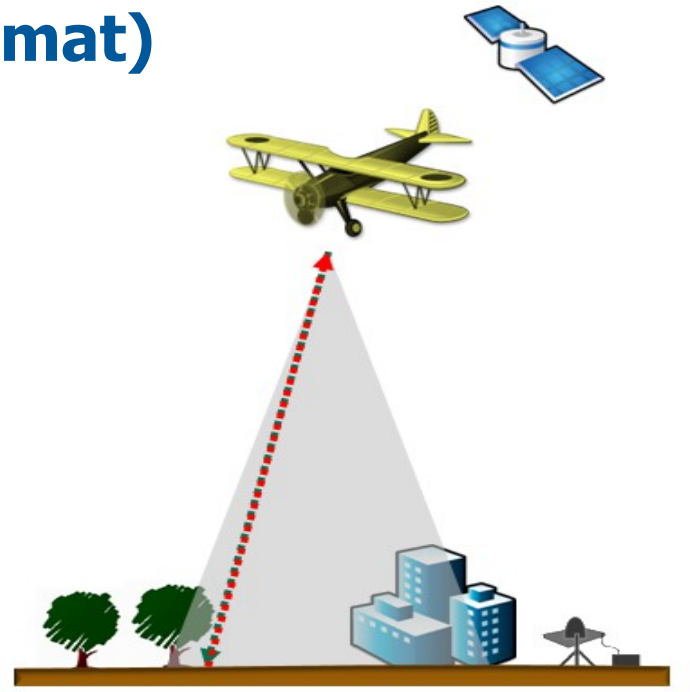
Was ist Point Cloud?



Point Cloud = LIDAR-Daten

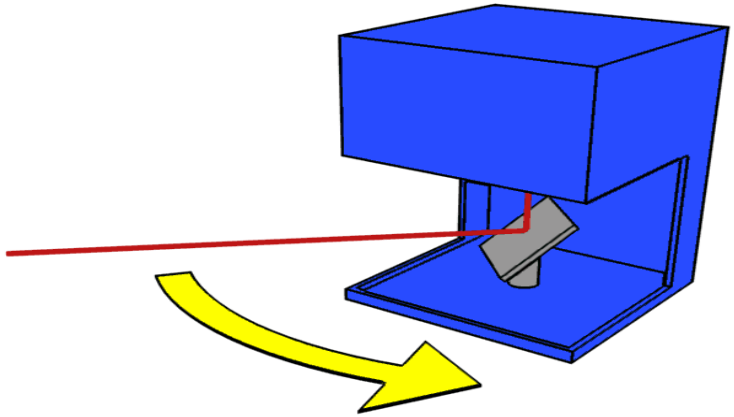
- Mehrdim. Daten von LIDAR-Sensoren
- LIDAR: „Light Detection and Ranging“
- Grosse Datenmengen innert kürzester Zeit
- z.B. 500 GB in 15 min. (LAS-Format)

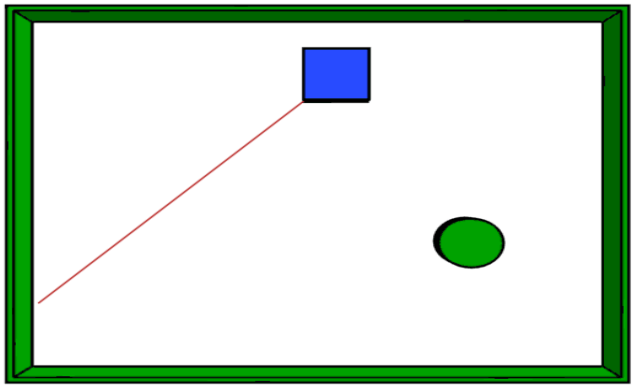




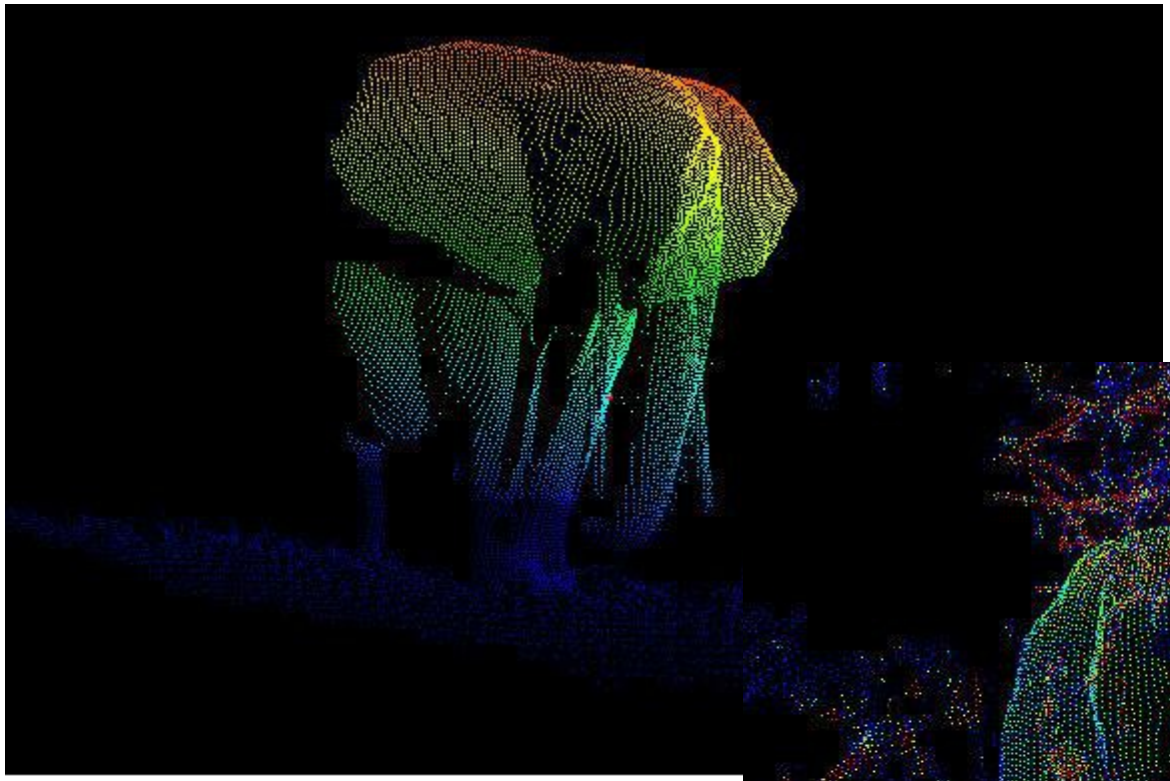
Credits: http://resources.arcgis.com/

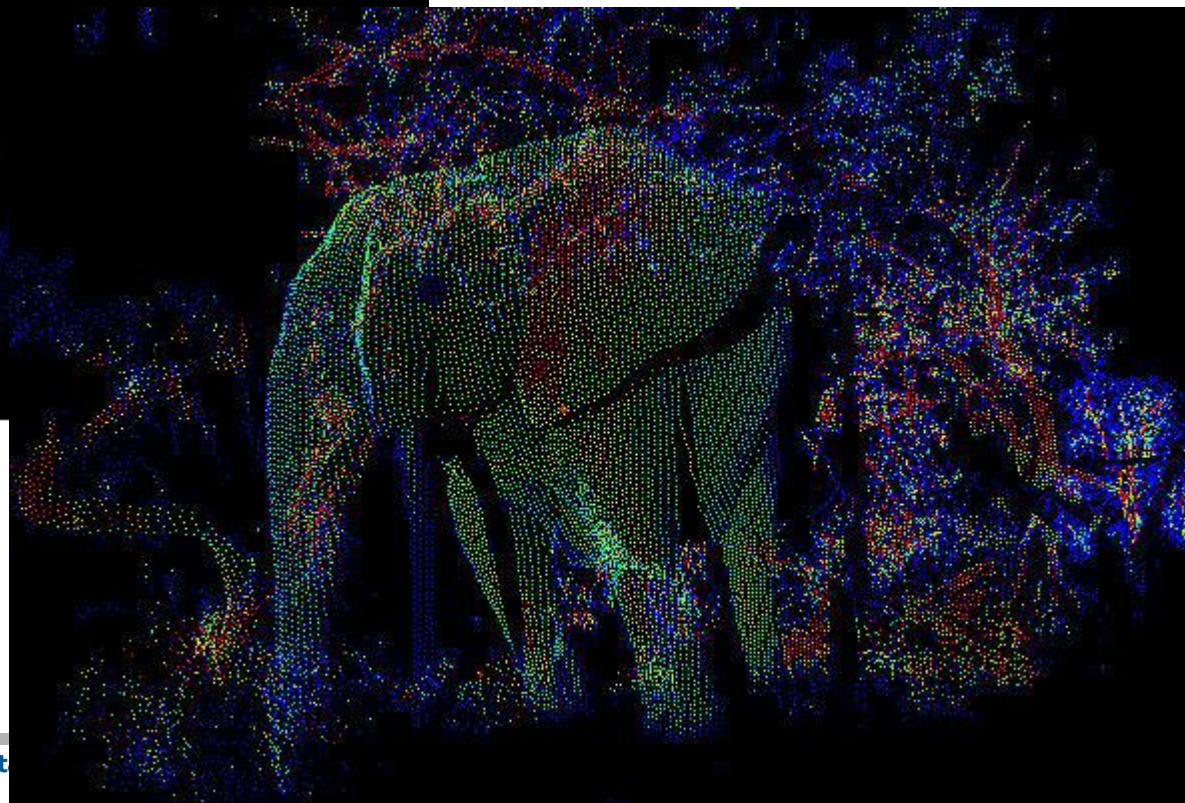
LIDAR ff.



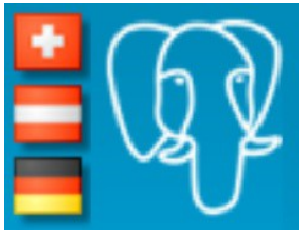


The LIDAR Elephant





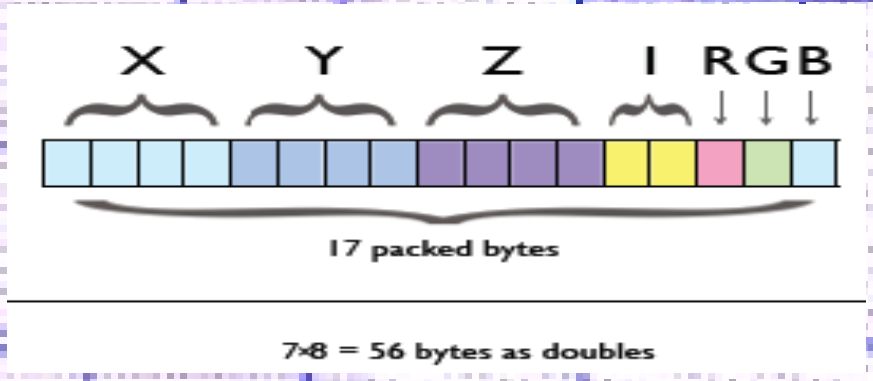
LIDAR Daten



(X, Y, Z, Intensity, ReturnNumber, NumberOfReturns, Classification, ScanAngleRank, Red, Green, Blue)

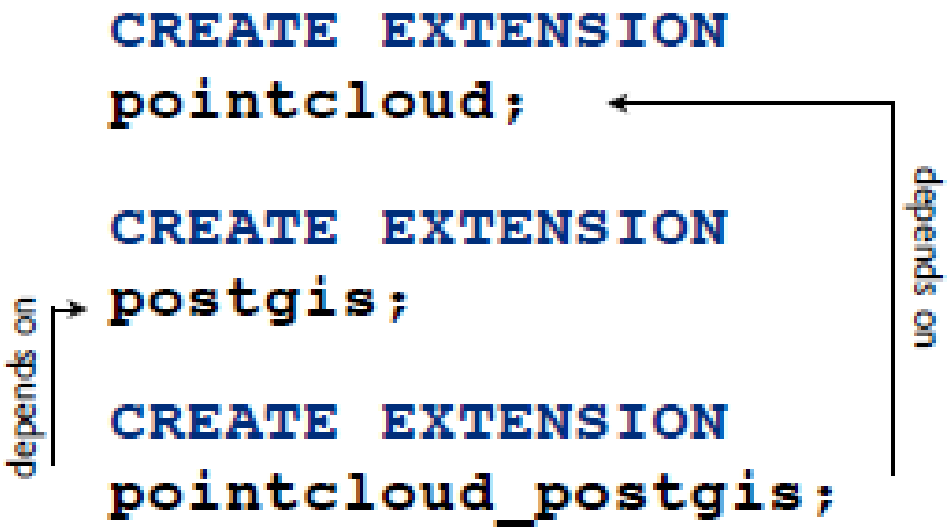

Warum ein
eigener
Datentyp?

PcPoint(pcid)
PcPatch(pcid)

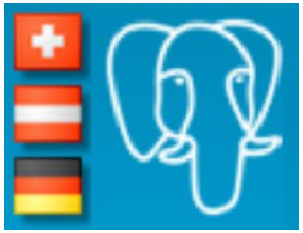


Pointcloud Extension

- PcPatch ist eine Collection von
- ... PcPoint
- ... beschrieben in einem XML Schema
- ... gespeichert in Tabelle pointcloud_formats (und View pointcloud_columns)
- ... verknüpft mit pcid

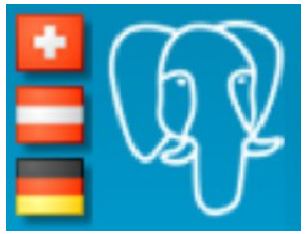


pointcloud Extension



```
INSERT INTO pointcloud_formats (pcid, srid, schema)
VALUES (1, 0,
'<?xml version="1.0" encoding="UTF-8"?>
<pc:PointCloudSchema
 xmlns:pc="http://pointcloud.org/schemas/PC/1.1"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <pc:dimension>
    <pc:position>1</pc:position>
    <pc:size>4</pc:size>
    <pc:description>X coordinate.</pc:description>
    <pc:name>X</pc:name>
    <pc:interpretation>int32_t</pc:interpretation>
    <pc:scale>0.01</pc:scale>
  </pc:dimension>
  <pc:dimension>
    <pc:position>2</pc:position>
    <pc:size>4</pc:size>
    <pc:description>Y coordinate.</pc:description>
    <pc:name>Y</pc:name>
    <pc:interpretation>int32_t</pc:interpretation>
    <pc:scale>0.01</pc:scale>
  </pc:dimension>
```

pointcloud Extension



```
CREATE TABLE pcpoints (
   id SERIAL PRIMARY KEY,
   pt PcPoint(1)
);
INSERT INTO pcpoints (pt)
VALUES (
  PC_MakePoint(1,
   ARRAY[-126, 45, 34, 4]
  )
 );
```

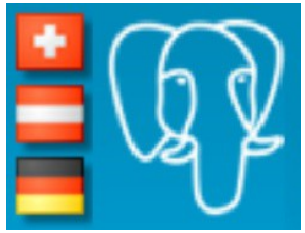
pointcloud Extension

```
SELECT pt FROM pcpoints;

0101000000C8CEFFFF94110000
480D00000400

SELECT PC_AsText(pt)
   FROM pcpoints;

{"pcid":1,
 "pt": [-126, 45, 34, 4]}
```

pointcloud Extension

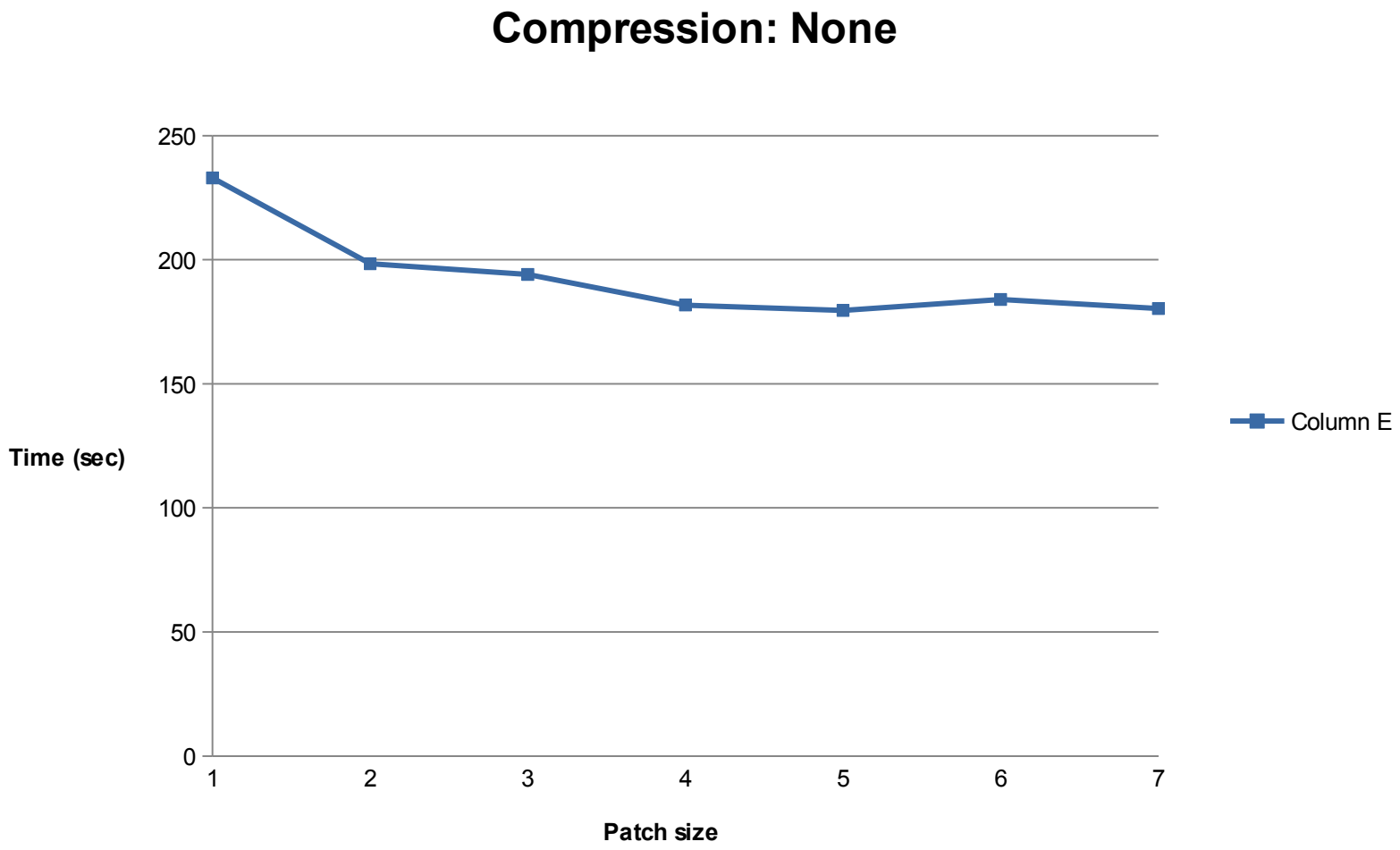

```
SELECT
  Count(*)
  Sum(PC_NumPoints(pa))
FROM mtsthelens;

 count |    sum
-------+----------
 30971 | 12388139
```

Benchmark it!

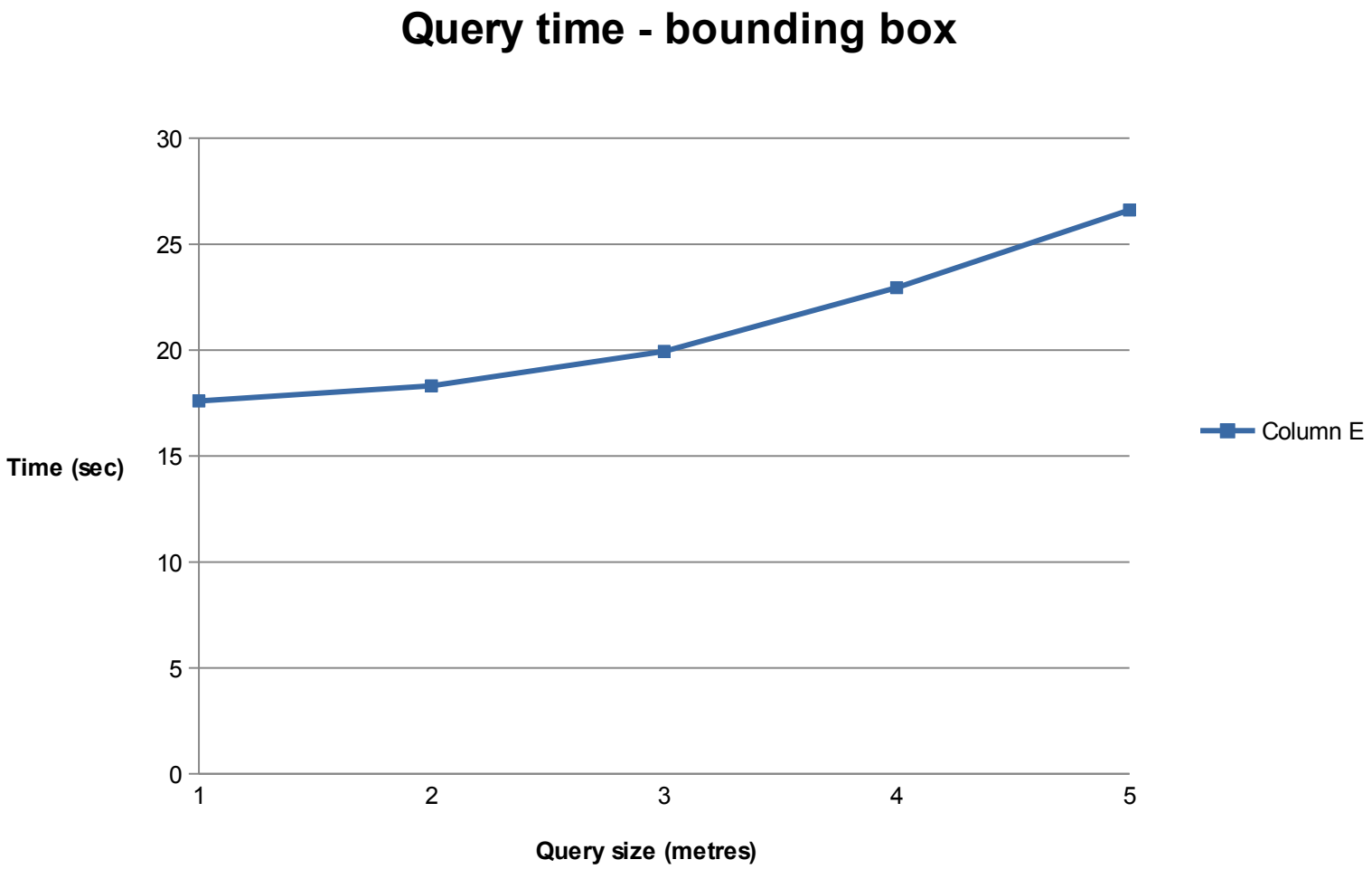


- Load
  - No compression, compression
- Query BBox
  - Bbox size: 200m x 200m, 400m x, 600m x, 800m x, 1000m x
- Query BBox w/Filter
  - BBox as above
  - WHERE elevation ('Z') > 1800

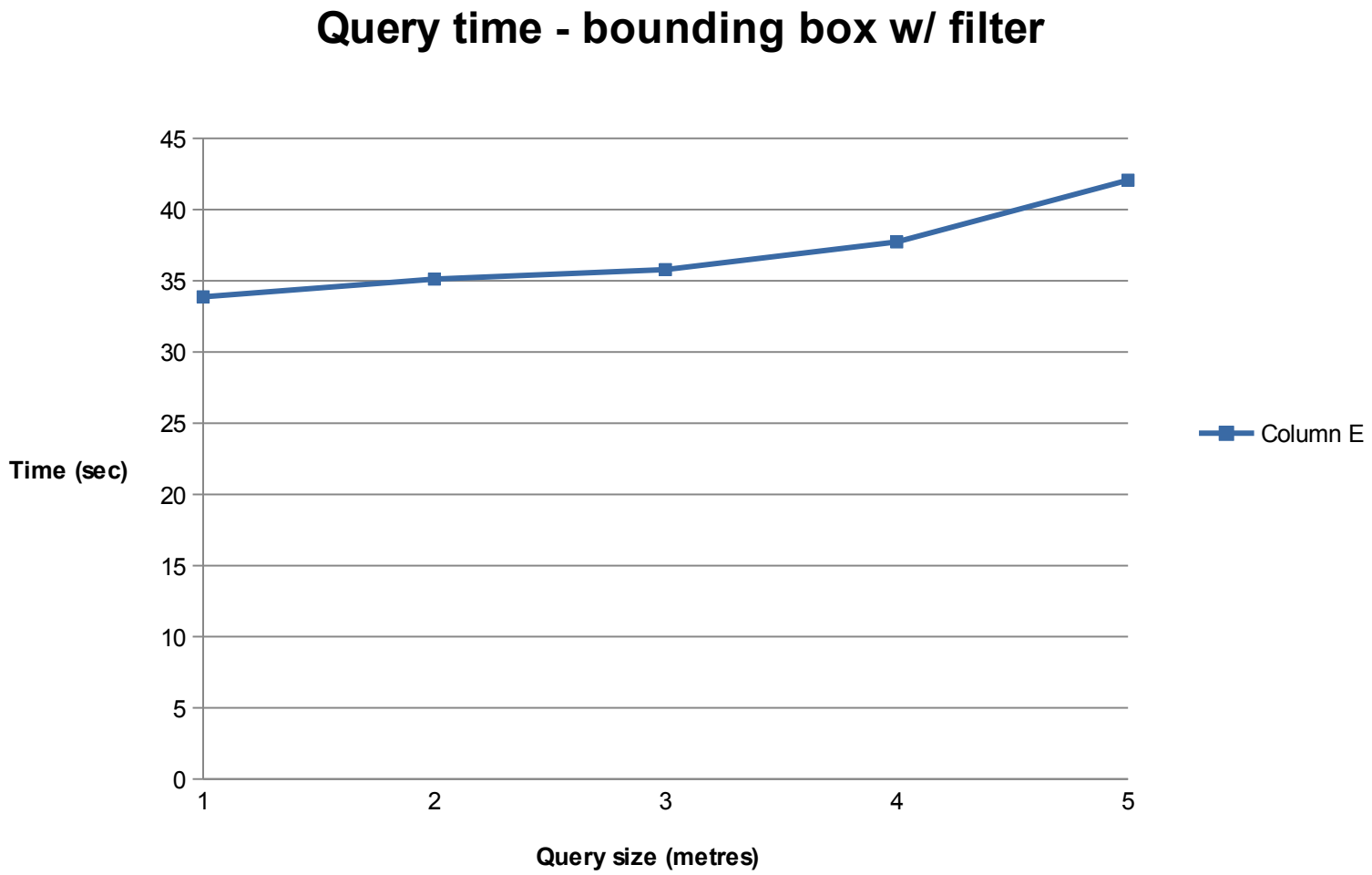
Benchmark Load



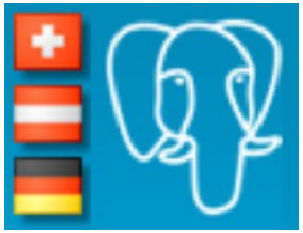
Benchmark Query BBox



Benchmark Query BBox w/Filter



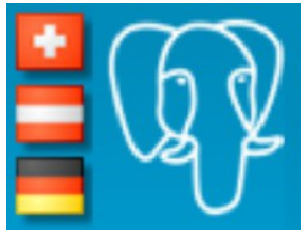
Zusammenfassung



- ...

?

Kontakt



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