PostGIS
and
Disaster Management

Who

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I do maps.

I do maps.

PostGIS (thus Postgres)
Mapnik
Satellite imagery
Drone imagery
Mobile device positioning

Plan

1. PostGIS

- What's new in 2.5 and up in 3.0

2. Disaster management

- Why is it unlike anything else

Previously

Skip full index scan during cleanup of B-tree indexes when possible

Vacuum of index consists from two stages: multiple (zero of more) ambulkdelete
calls and one amvacuumcleanup call. When workload on particular table
is append-only, then autovacuum isn't intended to touch this table. However,
user may run vacuum manually in order to fill visibility map and get benefits
of index-only scans. Then ambulkdelete wouldn't be called for indexes
of such table (because no heap tuples were deleted), only amvacuumcleanup would
be called In this case, amvacuumcleanup would perform full index scan for
two objectives: put recyclable pages into free space map and update index
statistics.

This patch allows btvacuumclanup to skip full index scan when two conditions
are satisfied: no pages are going to be put into free space map and index
statistics isn't stalled. In order to check first condition, we store
oldest btpo_xact in the meta-page. When it's precedes RecentGlobalXmin, then
there are some recyclable pages. In order to check second condition we store
number of heap tuples observed during previous full index scan by cleanup.
If fraction of newly inserted tuples is less than
vacuum_cleanup_index_scale_factor, then statistics isn't considered to be
stalled. vacuum_cleanup_index_scale_factor can be defined as both reloption and GUC (default).

This patch bumps B-tree meta-page version. Upgrade of meta-page is performed
"on the fly": during VACUUM meta-page is rewritten with new version. No special
handling in pg_upgrade is required.

Author: Masahiko Sawada, Alexander Korotkov
Review by: Peter Geoghegan, Kyotaro Horiguchi, Alexander Korotkov, Yura Sokolov
Discussion: https://www.postgresql.org/message-id/flat/CAD21AoAX+d2oD_nrd9O2YkpzHaFr=uQeGr9s1rKC3O4ENc568g@mail.gmail.com

⑂ master (#1)   🏷 REL_11_1 ... REL_11_BETA1

🛅 feodor committed on 4 Apr 2018   1 parent eac93e2   commit 857f9c36cda520030381bd8c2af20adf0ce0e1d4

vacuum_cleanup_index_scale_factor = 1000000000000000

turn it off

Что надо для счастья

- clustered write
- better GiST
        Balance the tree!
           sort and order!
- faster vacuum
        don't vacuum too much!

- working Index Only
        ou Append Only
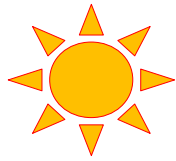
Что надо для счастья

- clustered write
- better GiST
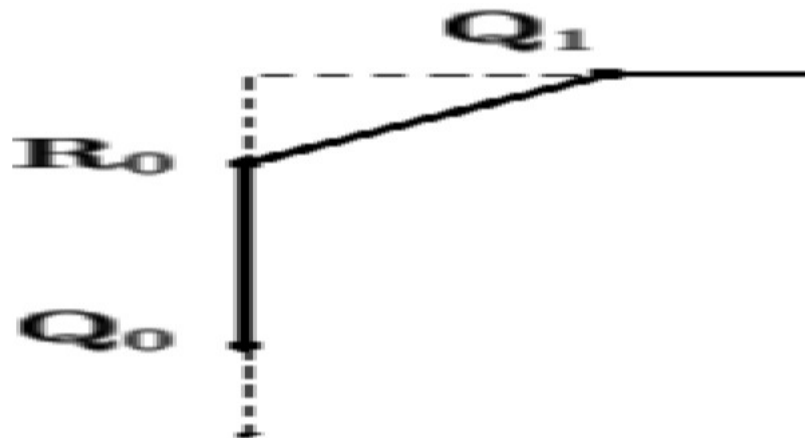 - Balance the tree!
  - sort and order!
- faster vacuum
  - don't vacuum too much!

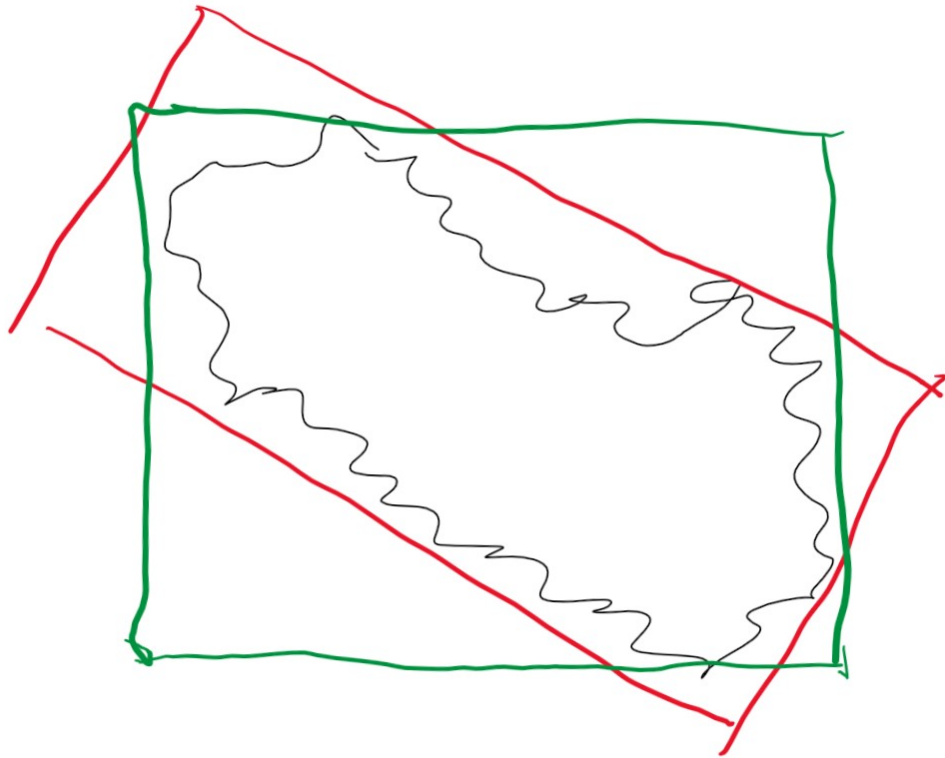- working Index Only
- or Append Only

PostGIS 2.5

ST_ChaikinSmoothing

ST_OrientedEnvelope

ST_QuantizeCoordinates

```
digits |                          encode                          |                  st_astext
--------+----------------------------------------------------------+----------------------------------------------
15      | 01010000005f9a72083cdd5e405f9a72083cdd5e40               | POINT(123.456789123456 123.456789123456)
14      | 01010000005f9a72083cdd5e405f9a72083cdd5e40               | POINT(123.456789123456 123.456789123456)
13      | 01010000005f9a72083cdd5e405f9a72083cdd5e40               | POINT(123.456789123456 123.456789123456)
12      | 01010000005c9a72083cdd5e405c9a72083cdd5e40               | POINT(123.456789123456 123.456789123456)
11      | 0101000000409a72083cdd5e40409a72083cdd5e40               | POINT(123.456789123456 123.456789123456)
10      | 0101000000009a72083cdd5e40009a72083cdd5e40               | POINT(123.456789123455 123.456789123455)
9       | 01010000000090720 83cdd5e40009072083cdd5e40              | POINT(123.456789123418 123.456789123418)
8       | 0101000000080720 83cdd5e40008072083cdd5e40               | POINT(123.45678912336 123.45678912336)
7       | 010100000000070083cdd5e40000070083cdd5e40                | POINT(123.456789121032 123.456789121032)
6       | 010100000000040083cdd5e40000040083cdd5e40                | POINT(123.456789076328 123.456789076328)
5       | 010100000000000083cdd5e40000000083cdd5e40                | POINT(123.456789016724 123.456789016724)
4       | 010100000000000003cdd5e40000000003cdd5e40                | POINT(123.456787109375 123.456787109375)
3       | 010100000000000003cdd5e40000000003cdd5e40                | POINT(123.456787109375 123.456787109375)
2       | 010100000000000038dd5e40000000038dd5e40                  | POINT(123.45654296875 123.45654296875)
1       | 0101000000000000000dd5e4000000000000dd5e40               | POINT(123.453125 123.453125)
0       | 0101000000000000000dc5e4000000000000dc5e40               | POINT(123.4375 123.4375)
-1      | 0101000000000000000c05e40000000000c05e40                 | POINT(123 123)
-2      | 01010000000000000000005e400000000000005e40               | POINT(120 120)
-3      | 010100000000000000000058400000000000005840               | POINT(96 96)
-4      | 010100000000000000000058400000000000005840               | POINT(96 96)
```

PostGIS 3.0

- Breaking fixes
- Removed SFCGAL clones
- Removed liblwgeom as installable library

PostGIS 3.0

- ST_AsMVT Feature ID (Stepan Kuzmin)
- SP-GiST ND (Esteban Zimányi and Arthur Lesuisse)

OpenStreetMap Data

osmium export -f pg data/planet-latest.osm.pbf | psql -1 -c 'create table osm(geom geometry, tags jsonb); copy osm from stdin freeze;'

osmium export

- Osmium is fast
- jsonb parser is slow
- jsonb GIN is slow
- GiST takes 9 hours on 3 hour import
- **Use it as your next benchmark**

Inlining

ST_DWithin,
ST_Intersects,
ST_Contains

depend on it.

Review inlining patches for PG12!

Disaster Management

Disaster Management

when your manager is a complete disaster

Disaster Management

...we back up all our virtual machines...

Disaster Management
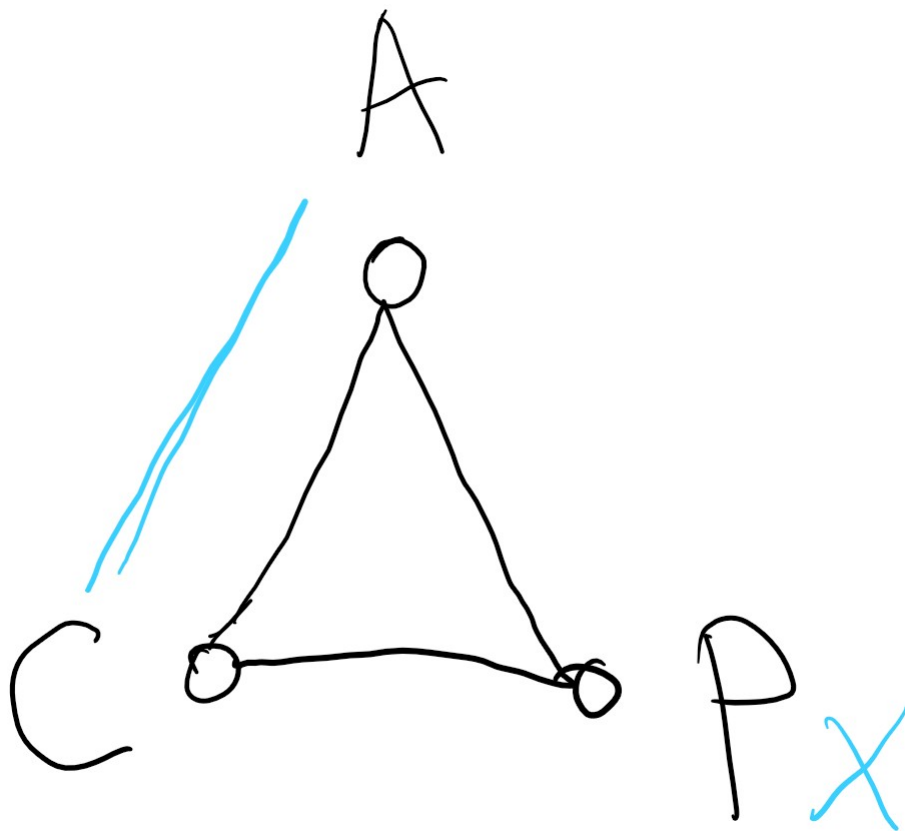
when explodes, gets on fire and falls apart

Pre-event

Pre-event

"Disaster Management"
called
"Risk Management"
when everything is okay

CAP theorem

Risk and Vulnerability

- Who do we give money to improve?
- Where do we invest and wait for returns?

  What may happen?

- What is our plan?

Conflict Zones

INFORM:
Index for Risk Management

THE INFORM GLOBAL RISK
INDEX MEASURES THE RISK
OF HUMANITARIAN CRISES
AND DISASTERS IN 191
COUNTRIES

COUNTRY	RISK	3 YR TREND	COUNTRY	RISK	3 YR TREND	COUNTRY	RISK	3 YR TREND
Afghanistan	7.8	→	Congo	5.5	→	Iran	4.9	→
Albania	2.8	→	Congo DR	7.6	↗	Iraq	7.2	→
Algeria	4.4	→	Costa Rica	2.9	→	Ireland	1.5	→
Angola	4.9	↗	Côte d'Ivoire	5.6	↘	Israel	2.6	→
Antigua and Barbuda	2.3	→	Croatia	2.2	→	Italy	2.7	→
Argentina	2.6	→	Cuba	3.3	↗	Jamaica	2.6	→
Armenia	3.5	→	Cyprus	2.7	→	Japan	2.0	→
Australia	2.3	→	Czech Republic	1.4	→	Jordan	4.1	→
Austria	1.6	↗	Denmark	1.1	→	Kazakhstan	2.2	→
Azerbaijan	4.7	→	Djibouti	5.4	↘	Kenya	6.1	→
Bahamas	2.2	→	Dominica	3.4	→	Kiribati	3.9	→
Bahrain	0.9	→	Dominican Republic	3.9	→	Korea DPR	4.7	↘
Bangladesh	6.0	→	Ecuador	4.2	→	Korea Republic of	1.6	→
Barbados	1.7	→	Egypt	4.8	→	Kuwait	2.0	→
Belarus	2.2	↗	El Salvador	4.1	→	Kyrgyzstan	3.8	→
Belgium	2.2	→	Equatorial Guinea	3.9	→	Lao PDR	4.2	↘
Belize	3.4	↘	Eritrea	5.2	→	Latvia	1.6	→
Benin	4.1	→	Estonia	1.0	→	Lebanon	5.3	→
Bhutan	3.0	→	Ethiopia	6.8	↗	Lesotho	4.6	→

Event

Do we need to do anything?

Everything falls apart
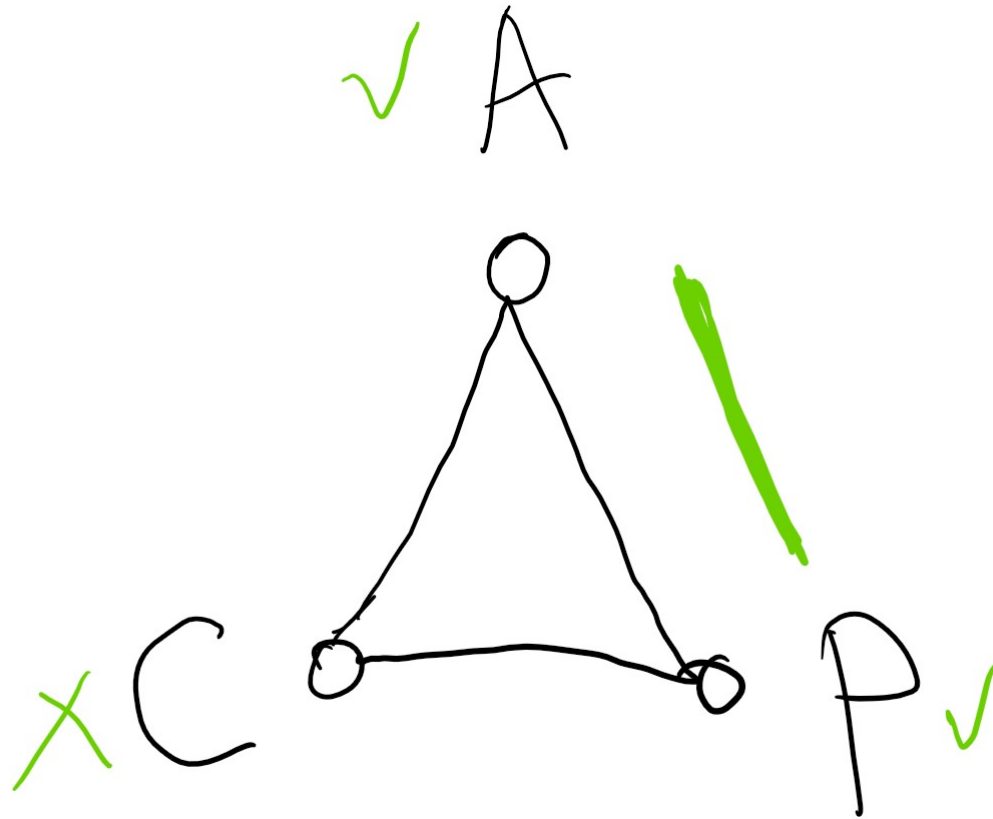
AP Storage System

All data becomes live

- Live population data: Facebook, mobile operators

- Drone imagery

- On-the-ground reports

- Map updates are minutely

HOT: Humanitarian OSM Team

Humanitarian OpenStreetMap Team

WHAT WE DO   OUR WORK   GET INVOLVED   **DONATE**

WHAT WE DO

hotosm.org

HOT is an international team dedicated to humanitarian action and community development through open mapping. We work together to provide map data which revolutionises disaster management, reduces risks, and contributes to achievement of the Sustainable Development Goals.

Post Event

Pre Event

Thank you

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