

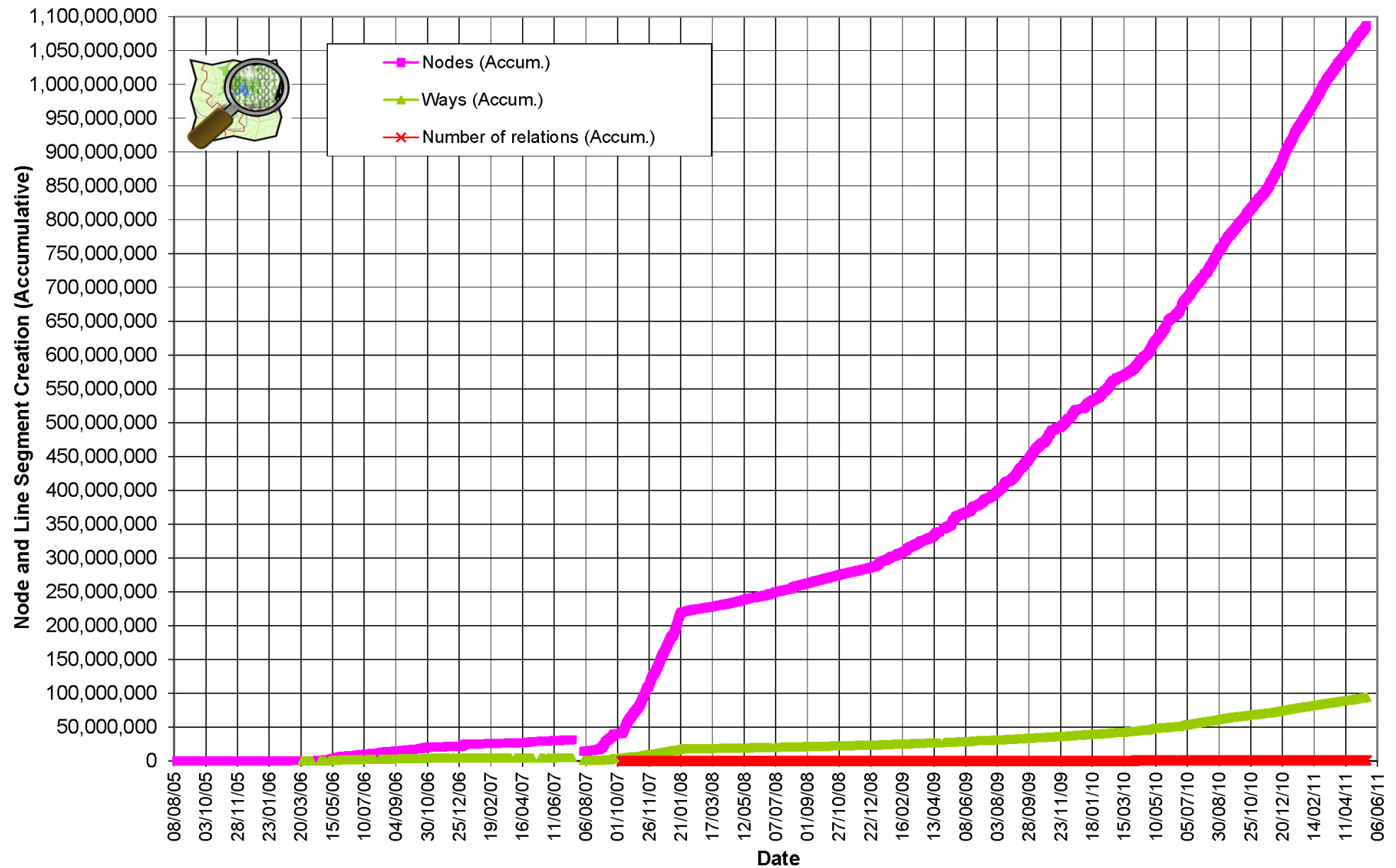


Osmium

Jochen Topf

OpenStreetMap Database Statistics

Node, Way and Relation Creation







INTERNATIONAL BESTSELLER

I CAN MAKE YOU **THIN**

The Revolutionary
System Used
by More Than
3 Million
People

Includes
Guided
Hypnosis
CD



PAUL McKENNA







Osmium

Osmium is a fast and flexible
C++ and Javascript
toolkit and framework
for working with OSM data.

Osmium is a Toolkit

Basic Objects

Node

Way

Relation

Area

Position

Bounds

Tag

RelationMember

...

Use of Basic Objects

```
node.id()
```

```
node.timestamp_as_string()
```

```
node.position().lon()
```

```
way.nodes().first().ref()
```

```
relation.members()
```

```
node.tags().add("highway", "service")
```

```
way.tags()[1].key()
```

Geometry Objects

Point

LineString

Polygon

MultiPolygon

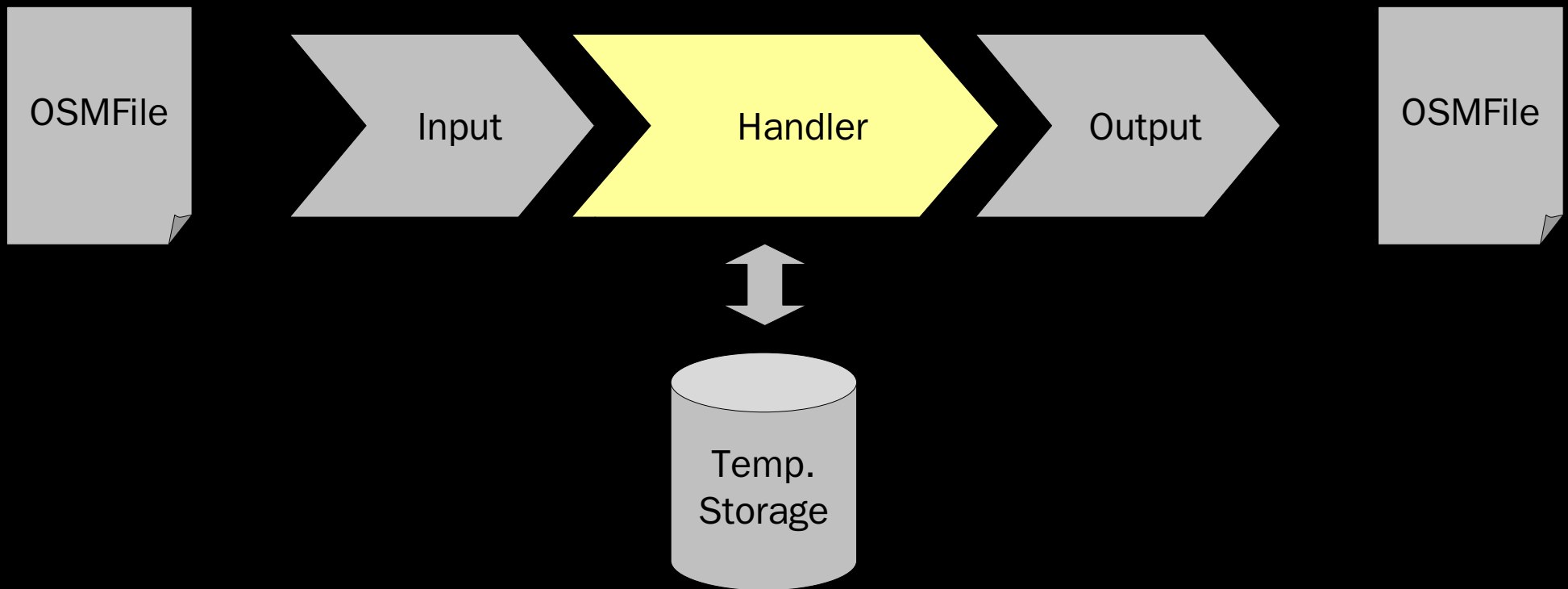
Use of Geometry Objects

```
Point p(node);  
cout << p.as_WKT() << "\n";  
cout << p.as_HexWKB() << "\n";  
p.create_geos_geometry();  
p.create_shp_object();
```

```
LineString line(way, true);  
MultiPolygon mp(area);
```

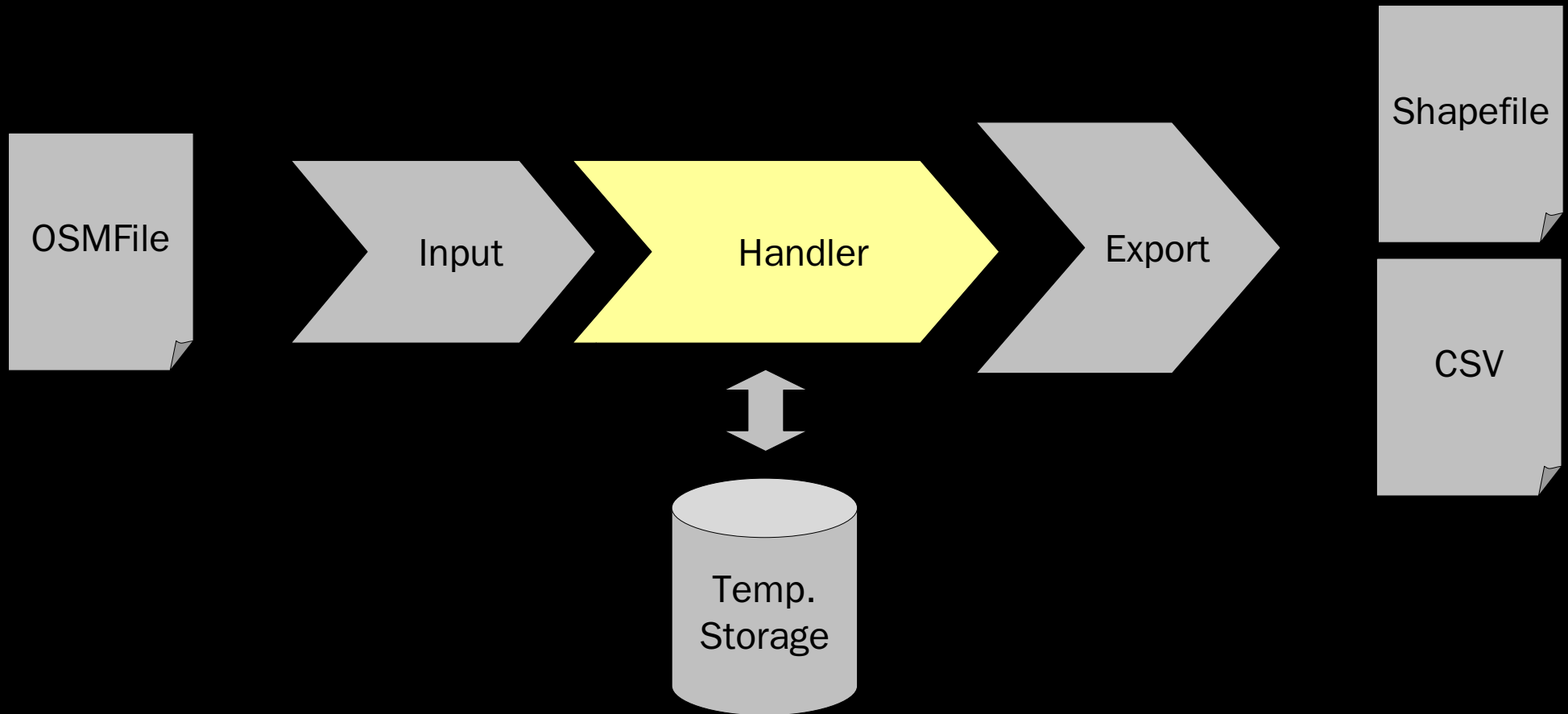
Osmium is a Framework

Architecture I



For implementing converters and filters

Architecture II



For implementing exporters

OSMFile

Read from file, stdin, or URL.

Write to file, stdout.

Format: XML or PBF.

Compressed or uncompressed.

With or without history.

No change (.osc) files yet.

Handler Callbacks

`init(meta)`

`before_nodes()`

`node(node)`

`after_nodes()`

`before_ways()`

`way(way)`

`after_ways()`

`before_relations()`

`relation(relation)`

`after_relations()`

`final()`

Handler Example

```
class MyHandler : public Osmium::Handler::Base
{
public:

    void node(const Osmium::OSM::Node* node)
    {
        cout << "node id=" << node->id() << "\n";

        Osmium::OSM::Position p=node->position();

        cout << "lon=" << p.lon() << "\n";
        cout << "lat=" << p.lat() << "\n";
    }
}
```

Main Program Example

```
#include <osmium.hpp>
#include "myhandler.hpp"

int main(int argc, char* argv[]) {
    Osmium::init();

    Osmium::OSMFile infile(argv[1]);
    MyHandler handler;
    infile.read(handler);
}
```

Available Handlers

Debug

Statistics

CoordinatesForWays

Multipolygon

CoordinatesForWays Handler

- reads Positions from Nodes
- writes Positions to Ways

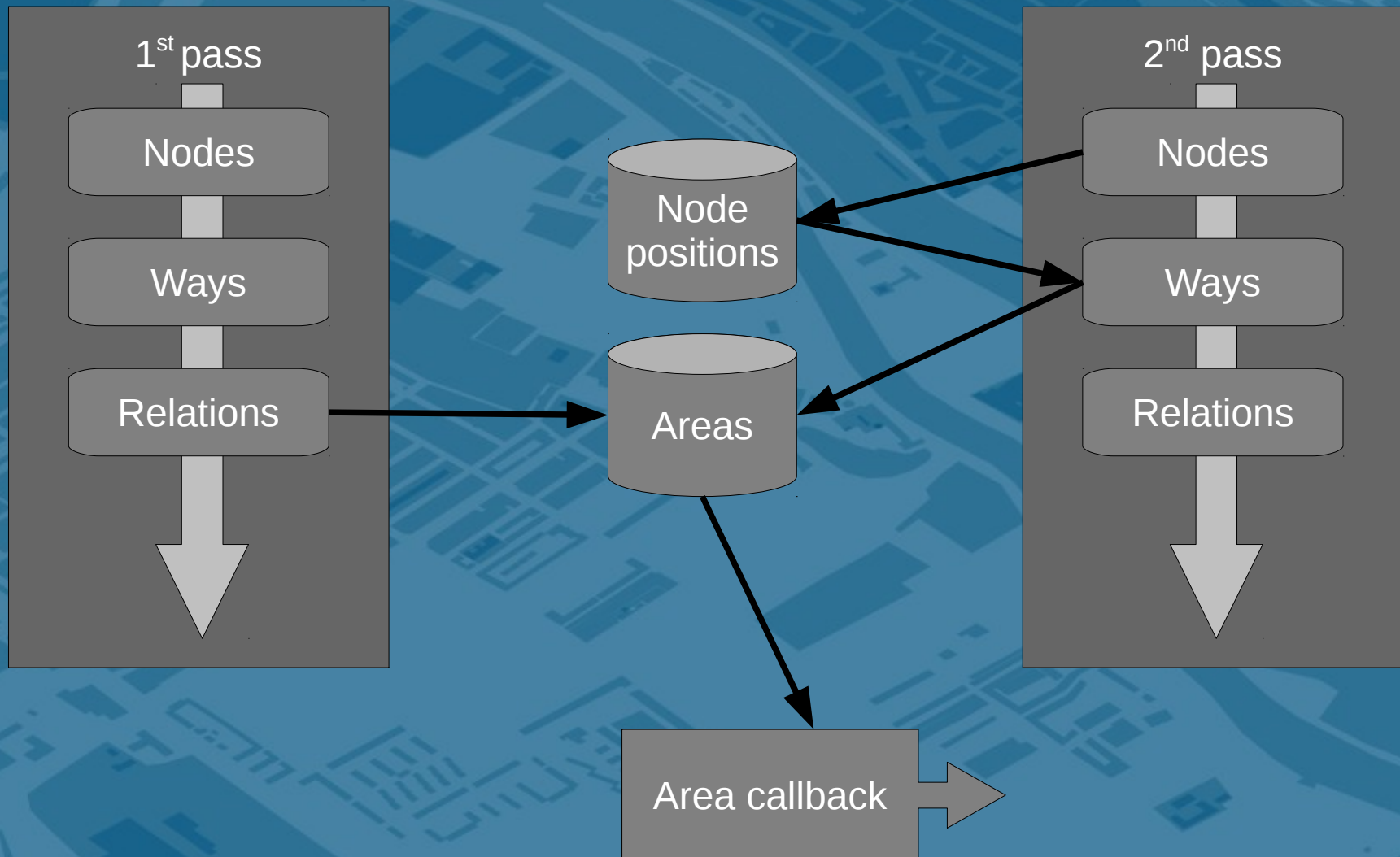
Storage: Mmap or SparseTable

Multipolygons

from ways
from relations
(type=multipolygon/border)

handles nested multipolygons
handles touching inner rings
ignores wrong roles (inner/outer)
fixes some broken geometries

Assembling Multipolygons



Compiling

Header-only library

Compiles without warnings
on
GCC (g++) and LLVM (clang)

Some unit tests

Options:

`-D OSMIUM_WITH_JAVASCRIPT/GEOS/SHPLIB`

Operating Systems

Development on Linux

Compiles on Mac OSX

Nobody looked at Windows support yet

Examples

osmium_debug

osmium_convert

osmium_toshape

...

Node Density Example



Taginfo

Stats with hundreds of millions of data points

Runs in <1 hour on 800MHz machine

Needs <3.5 GBytes of memory

But wait...

...there is more

C++ is not everybody's favourite.

Google V8 Javascript Engine

Relatively easy to embed in C++ code

Compiles Javascript

Really fast

Open Source

Osmium Javascript Handler

Callbacks into your Javascript Code

Access to Basic Objects

Access to Exporters

osmjs

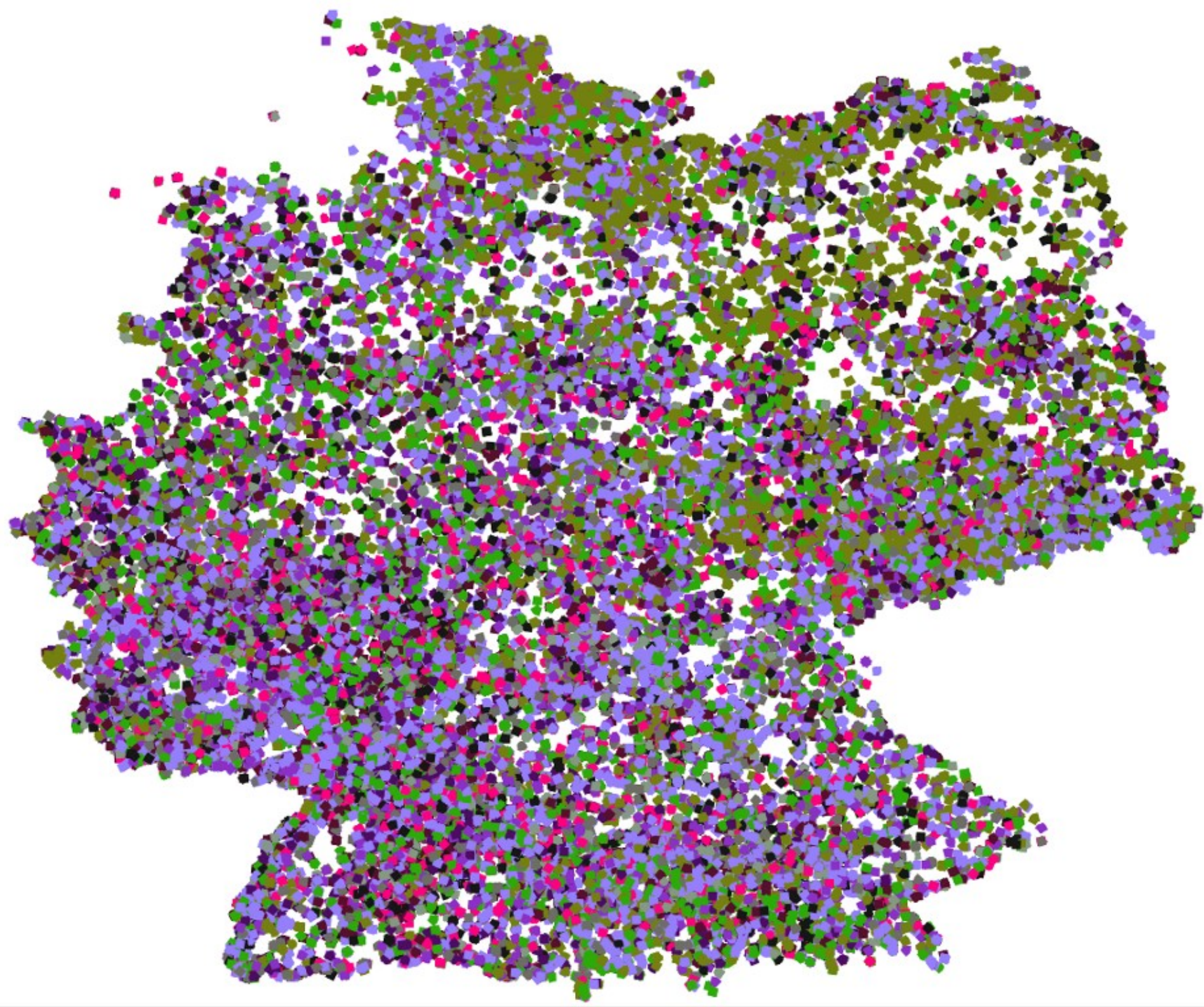
Includes Javascript and Multipolygon handlers

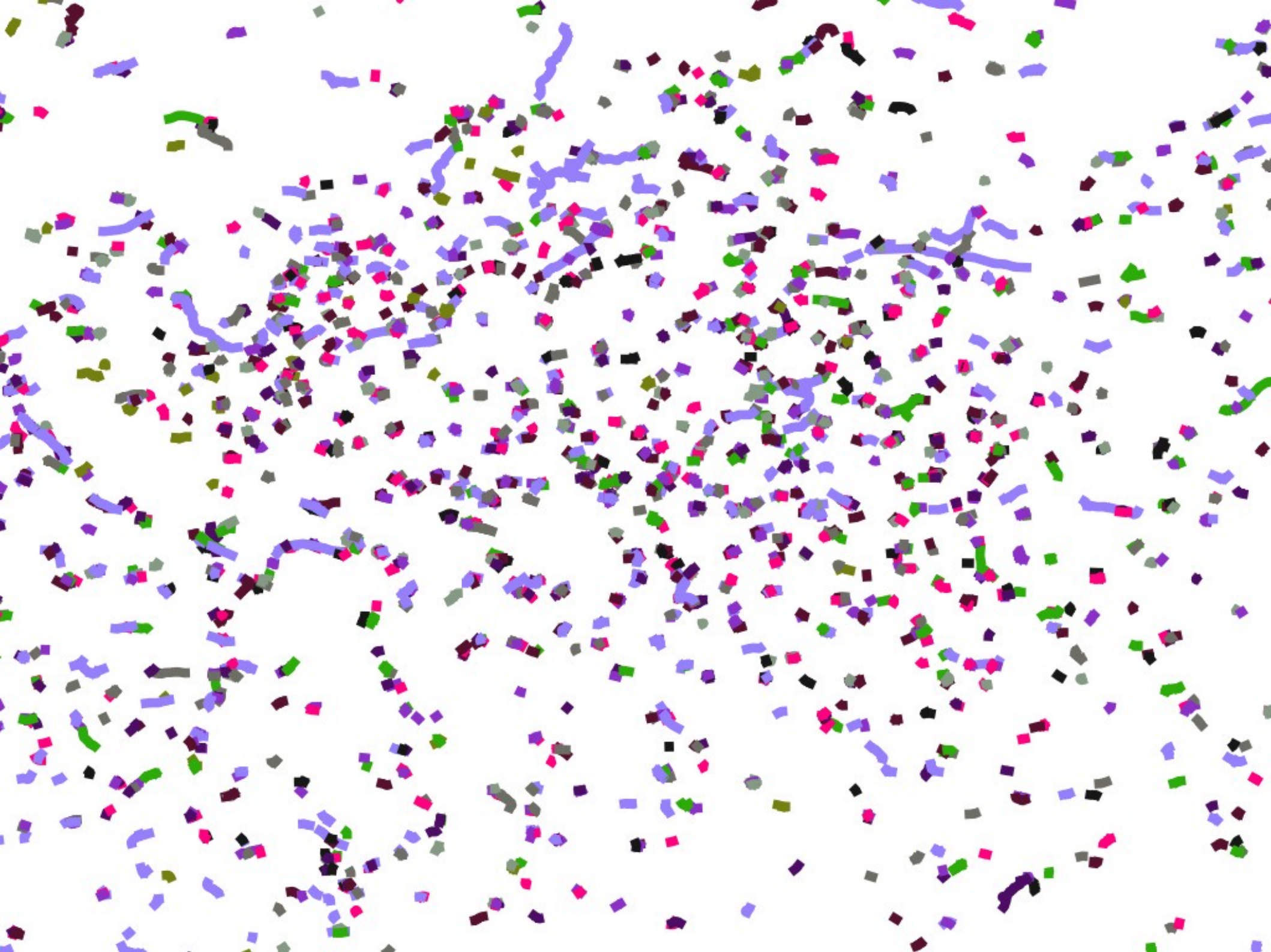
```
osmjs -j objects.js planet.osm.pbf
```

```
osmjs -2 -l array -j objects_2pass.js planet.osm.pbf
```

Popular Street Names

```
var shp = Osmium.Output.Shapefile.open('streets',  
                                         'line');  
shp.add_field('name', 'string', 32);  
  
Osmium.Callbacks.way = function() {  
    if (this.tags.highway &&  
        this.tags.name &&  
        this.tags.name.match(/^(Haupt|Bahnhof|  
                                Dorf|...)straße$/)) {  
        shp.add(this.geom, { name: this.tags.name });  
    }  
}  
  
Osmium.Callbacks.end = function() {  
    shp.close();  
}
```





Shapefile Export

```
shapefile('roads').  
  type(LINE).  
  column('name', STRING, 100).  
  column('oneway', BOOL);  
  
way('highway').  
  output('roads').  
  attr('name').  
  attr('oneway', function(obj, options) {  
    if (obj.tags.oneway.match(/^(1|yes|true)$/)) {  
      return true;  
    } else if (obj.tags.oneway == '-1') {  
      options.geom = obj.reverse_geom;  
      return true;  
    }  
    return false;  
  });
```

Support for History Data

Minimal support in Osmium, more to come

Can be read and written

Peter Körner has been working on this

Extracts available

With help from...

Frederik Ramm, Christian Vetter, Peter Körner

European Environment Agency (EEA)



Osmium

Free
Fast
Flexible
For you

Osmium

Free
Fast
Flexible
For you

A red speech bubble with a tail pointing towards the bottom left, containing the text "Needs your input".

Needs your input

But it is not finished

The End

`wiki.osm.org/wiki/Osmium`

`osmiumapi.openstreetmap.de`

`github.com/joto/osmium`

Jochen Topf

`jochen@topf.org`