

# OSM XML

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Available languages — *OSM XML*

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目录

- 1 Basics
- 2 OSM XML file format notes
  - 2.1 Example OSM XML file
  - 2.2 Contents
  - 2.3 Certainties and Uncertainties
- 3 Tools
- 4 Flavours
  - 4.1 JOSM file format
  - 4.2 osmChange
- 5 Technical features of change formats
  - 5.1 placeholders
  - 5.2 indication of origin
  - 5.3 streamable
- 6 See also

## Basics

XML is a so called meta format to provide even human readable data interexchange formats. Various file formats use this data tree structure to embedd their datas like XHTML, SVG, ODT, ...

Pros	Cons
<ul style="list-style-type: none"><li>human readable because of clear structure</li><li>machine independent due to exact definitions, e.g. character sets, XML schema definitions, DTD, namespaces...</li><li>ready to use parsers for general XML that can be customized for a concrete file format</li><li>good compression ratio</li></ul>	<ul style="list-style-type: none"><li>very huge files when decompressed</li><li>might need to decompress before processing (data compression/decompression may be performed on the fly by the transport protocol such as HTTP)</li><li>parsing <i>may</i> take a lot of time and memory resources, but only when using the full XML capabilities; basic XML (without DTD and namespaces) however is very fast and can be performed efficiently on the fly, without computing the DOM for the whole XML document (e.g. with simple SAX parsers)</li></ul>

## OSM XML file format notes

*No official .xsd Schema exists. See below and the OSM XML/XSD, and OSM XML/DTD pages for details of unofficial attempts to define the format in those languages.*

The major tools in the OSM universe use an XML format following a XML schema definition that was first used by the API only. Basically it is a list of instances of our data primitives (nodes, ways, and relations).

## Example OSM XML file

Here is a shortened example of a *complete* OSM XML file. Not every OSM XML file will contain all of these types of elements. See more in the notes below.

```
<?xml version="1.0" encoding="UTF-8"?>
<osm version="0.6" generator="CGImap 0.0.2">
  <bounds minlat="54.0889580" minlon="12.2487570" maxlat="54.0913900" maxlon="12.2524800"/>
  <node id="298884269" lat="54.0901746" lon="12.2482632" user="SvenHR0" uid="46882" visible="true">
    <tag k="name" v="Neu Broderstorf"/>
    <tag k="traffic_sign" v="city_limit"/>
  </node>
  ...
  <node id="298884272" lat="54.0901447" lon="12.2516513" user="SvenHR0" uid="46882" visible="true">
  <way id="26659127" user="Masch" uid="55988" visible="true" version="5" changeset="4142606" tin
    <nd ref="292403538"/>
    <nd ref="298884289"/>
    ...
    <nd ref="261728686"/>
    <tag k="highway" v="unclassified"/>
    <tag k="name" v="Pastower Straße"/>
  </way>
  <relation id="56688" user="kmvar" uid="56190" visible="true" version="28" changeset="6947637">
    <member type="node" ref="294942404" role=""/>
    ...
    <member type="node" ref="364933006" role=""/>
    <member type="way" ref="4579143" role=""/>
    ...
    <member type="node" ref="249673494" role=""/>
    <tag k="name" v="Küstenbus Linie 123"/>
    <tag k="network" v="VWV"/>
    <tag k="operator" v="Regionalverkehr Küste"/>
    <tag k="ref" v="123"/>
    <tag k="route" v="bus"/>
    <tag k="type" v="route"/>
  </relation>
  ...
</osm>
```

See Elements for details of the object categories.  
See Map features about how real world objects are modeled and categorized.

## Contents

- an XML suffix introducing the UTF-8 character encoding for the file
- an osm element, containing the version of the API (and thus the features used) and the generator that distilled this file (e.g. an editor tool)
  - a block of nodes containing especially the location in the WGS84 reference system
    - the tags of each node
  - a block of ways
    - the references to its nodes for each way
    - the tags of each way
  - a block of relations
    - the references to its members for each relation
    - the tags of each relation

## Certainties and Uncertainties

If you develop tools using this format, you can be certain that:

- blocks come in this order
- bounds will be on API and JOSM data

You can *not* be certain that:

- blocks are there (e.g. only nodes, no ways)
- blocks are sorted
- element IDs are non negative (Not in all osm files. Negative ids are used by editors for new elements)
- elements have to contain tags (Many elements do not. You will even come across Untagged unconnected nodes)
- visible only if false and not in Planet.osm
- id or user name present (Not always, due to anonymous edits in a very early stage)
- Changesets have an attribute num\_changes (This was abandoned from the history export tool because of inconsistencies)
- version ordering is sequential (doesn't have to be)

JOSM uses an 'action' attribute instead of timestamp, version or changeset for new objects

Some flavours might have other restrictions.

## Tools

See Planet.osm and Import, Export, Convert

## Flavours

There are a few different file formats currently in use, all with slightly different goals.

- API
- JOSM file format
- osmChange
- planetdiff
- Osmdiff

### JOSM file format

*Main article:* JOSM file format

The file format was designed by the author of JOSM. It basically is a logical extension of the data sent from the server. What it adds is an indication of the origin of the data and the bounding box it comes from (if possible). It is actually more of a storage format of data downloaded along with changes made by the user.

pros	cons
<ul style="list-style-type: none"><li>■ Supports placeholders</li><li>■ Indicates the source of the data</li></ul>	<ul style="list-style-type: none"><li>■ not streamable, must read the whole file prior to applying</li></ul>

Supported by:

- JOSM
- Bulk\_upload.py (read-only)
- [library (Geo::OSM)]
- osmconvert
- osmfilter

### osmChange

*Main article:* OsmChange OsmChange is a file format was created by the author of osmosis and is a more general format for representing changes.

pros	cons
<div><ul style="list-style-type: none"><li>Streamable</li></ul><p>When sorted properly this file is a continuous stream of changes that can be played in order. In osmosis the option <b>--sort-change</b> will put the change into streamable order.</p></div>	<div><ul style="list-style-type: none"><li>Doesn't indicate source of data</li></ul></div>

Placeholders are proposed as an extension though they are not widely supported.

Supported by:

- Osmosis
- Bulk\_upload.py (read-only)
- Geo::OSM library
- osmconvert
- osmchange (read-only)
- osmfilter

## Technical features of change formats

This a list of things that are desirable in a change file format for exampe change sets

### placeholders

Placeholders are a feature where objects that are created in the file can be used in the creation of the objects that depend on them. So a single file can create two nodes and join them with a segment without knowing beforehand the final IDs.

Objects with placeholders don't have any version number, creation timestamp, or user id or changeset associated to them (these properties will be set by the server and used to detect and report conflicting or desynchronized changes).

Placeholder IDs must be negative integers, assigned arbitrarily, but whose scope is local to the data file being sent to the data server where they will be created. After they are successfully created, the server returns the final IDs assigned to each object as positive integers, mapped for each submitted placeholder successfully created (as well as their initial version number, creation timestamp, and changeset identifier within which which they were created), so that the client can replace and use these final IDs in further requests when referencing the same objects.

### indication of origin

IDs used in OSM files can not be shared between servers. IDs are allocated by the server, not by clients. Thus it is useful if the change file indicates the source of any IDs used in the file.

### streamable

Whether the file can normally be processed in a stream, without breaking referential integrity.

## See also

- API
- OSM XML/XSD
  - API v0.6/XSD
- OSM XML/DTD
  - API v0.6/DTD
- Daily update an OSM XML file
- see also Category OSM API below

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