Quo vadis, web cartography?
(Draft)

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About...

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- free software, spatial databases, web technologies

Web mapping/cartography/GIS?[1]

Web mapping

is the process of designing, implementing, generating and delivering maps on the World Wide Web. Web mapping deals with **technological issues**.

Web cartography

additionally studies theoretic aspects: the use of web maps, the evaluation and optimization of techniques and workflows, the usability of web maps, social aspects, ...

Web GIS

is similar to web mapping but with an **emphasis** on analysis, processing of project specific geodata and exploratory aspects

[1] Wikipedia

Web mapping history

1989 (-23)	Birth of WWW (CERN)
1993 (-19)	Xerox (Palo Alto Research Center) - first interactive information retrieval
1994 (-18)	The National Atlas of Canada - first online atlas
1995 (-17)	The Gazeteer for Scotland - first geographical database with interactive mapping
1998 (-14)	Terraserver USA - serving aerial images (BW)
2003 (-9)	NASA World Wind - open virtual globe, using distributed resources
2004 (-8)	OpenStreetMap project, open source, open content world map
2005 (-7)	Google Maps - raster tiles organized in a quad-tree scheme
2006 ...	BOOM!

Web mapping standards history

2000 (-12) OGC WMS 1.0.0 - Web Map Service

2000 (-12) OGC GML 1.0 - Geography Markup Language

2001 (-11) OGC WMS 1.1.0 - Web Map Service

2001 (-11) OGC GML 2.0 - Geography Markup Language

2002 (-10) OGC WFS 1.0.0 - Web Feature Service

2002 (-10) OGC GML 3.0 - Geography Markup Language

2004 (-8) **OGC WMS 1.3.0 - Web Mapping Service**

2005 (-7) OGC WFS 1.1.0 - Web Feature Service

2007 (-5) **OGC GML 3.2.1 - Geography Markup Language**

2007 (-5) **TMS 1.0.0 - Tile Map Service (community)**

2010 (-2) **OGC WFS 2.0.0 - Web Feature Service**

2010 (-2) **OGC WMTS 1.0.0 - Web Map Tile Service**

2011 (-1) UTFGrid 1.1 - UTFGrid (community)

2012 (0) **UTFGrid 1.2 - UTFGrid (community)**

Web Mapping Technology

computer for prototyping any personal computer will be enough

internet connection no internet no web

web server handling high-level communications between the end user and mapping services

web mapping server engine behind maps on a web page, assembles data layers into an image

mapping data satellite imagery, database connections, GIS software files, text files, other web mapping servers over the Internet

mapping metadata data about data, describing where the mapping data came from, how it can be used, what it contains, and who to contact with questions

Web mapping services - overview

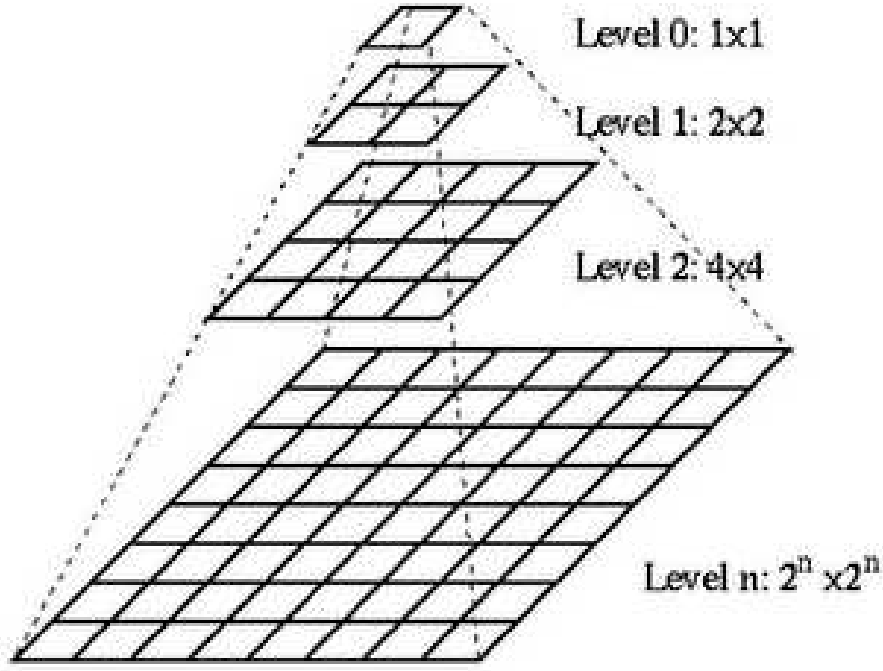
Normal web map/service (GIS):

- providers host mapping services
- clients (users) accessing mapping services (WMS, TMS, WFS, ...)
- many layers == slow, complex
- trying to emulate *"desktop"* experience

Content(user) centric web map:

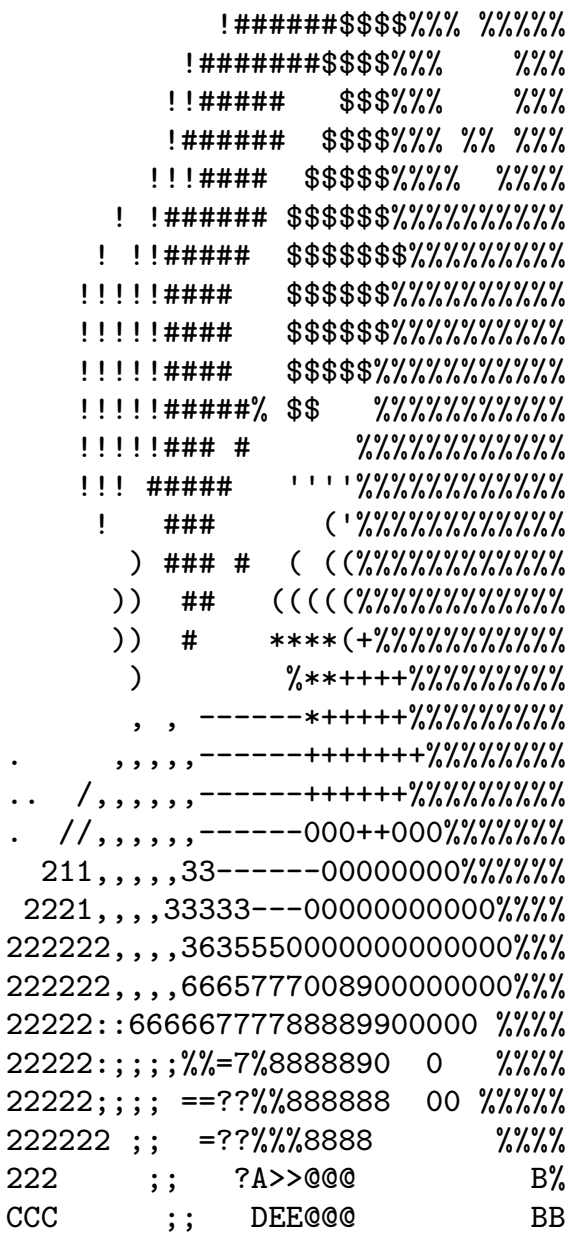
- map and data bundled together
- optimized user experience
- simple portable interface (works on multiple devices)

TMS - Tile Map Service




```
http://tms.server.com/1.0.0/layer_name/0/0/0.jpg
http://tms.server.com/1.0.0/layer_name/2/3/3.jpg
http://tms.server.com/1.0.0/layer_name/2/1/6.jpg
```

UTF-8 Grid



Examples:

- ! is mapped to Norway
- # is mapped to Sweden
- $ is mapped to Finland
- = is mapped to Croatia

Features:

- enables mouse interaction, on hover, on click
- default 4x4 px grid
- 4096 features per tile

The world of Open Source Cartography

Basic technology stack:

- GDAL toolkit
- PostgreSQL/PostGIS database
- TileMill (Mapnik, Node.js) - visualizations, map style
- TileStream - TMS server
- Nginx - web server
- Leaflet, JQuery (Javascript, CSS, HTML) - user interface

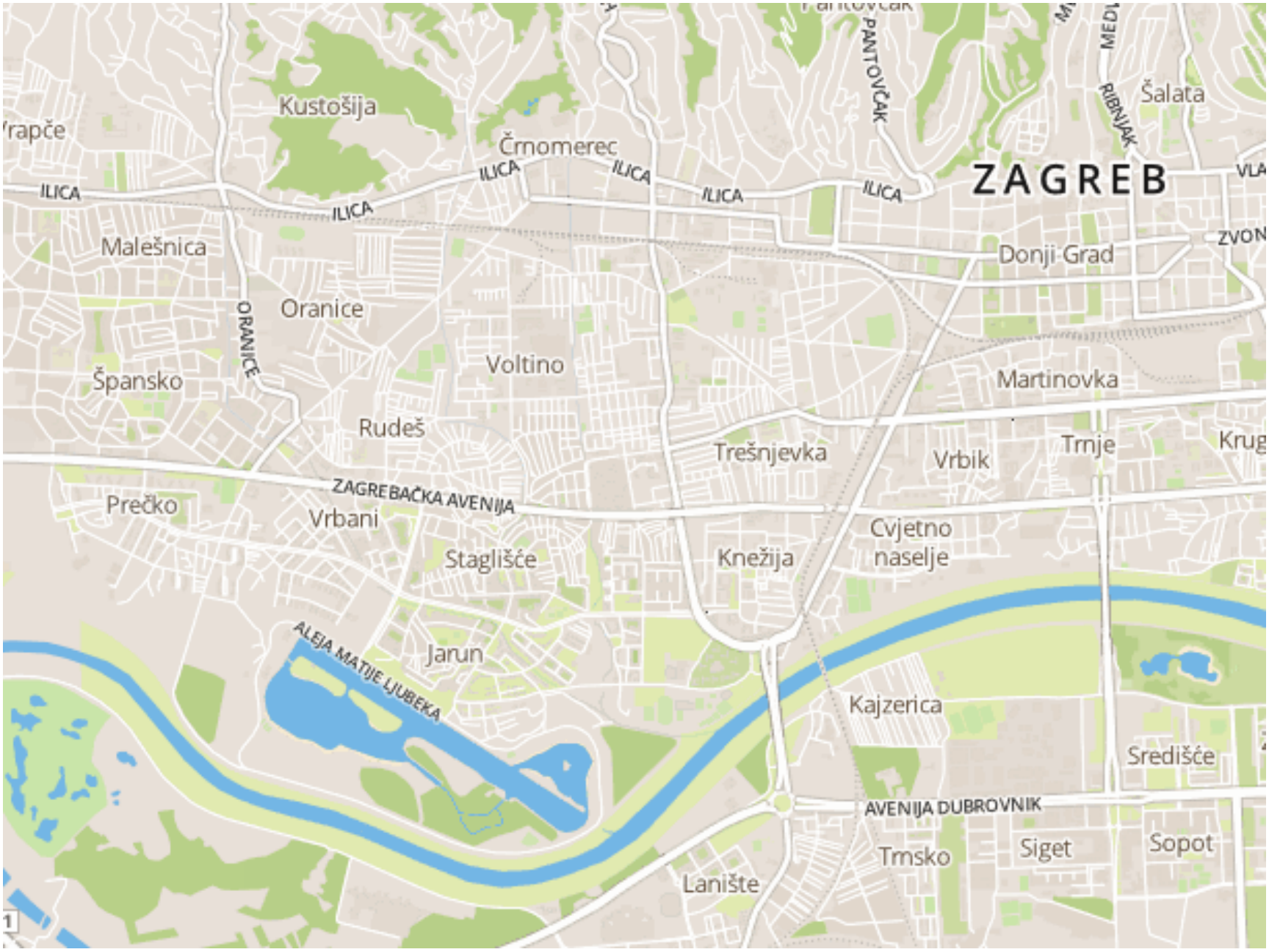
Cloud services

- cloud service provider handles:
  - hardware, software, backup, internet connection, utilities, ...
  - scalability, speed, reliability, ...
  - abstraction comes with a price tag (sweet spot)
- hides background technologies and shift focus onto cartographic tools
- MapBox, GisCloud, AutoCAD WS, ArcGIS Online, Google EarthBuilder, ...

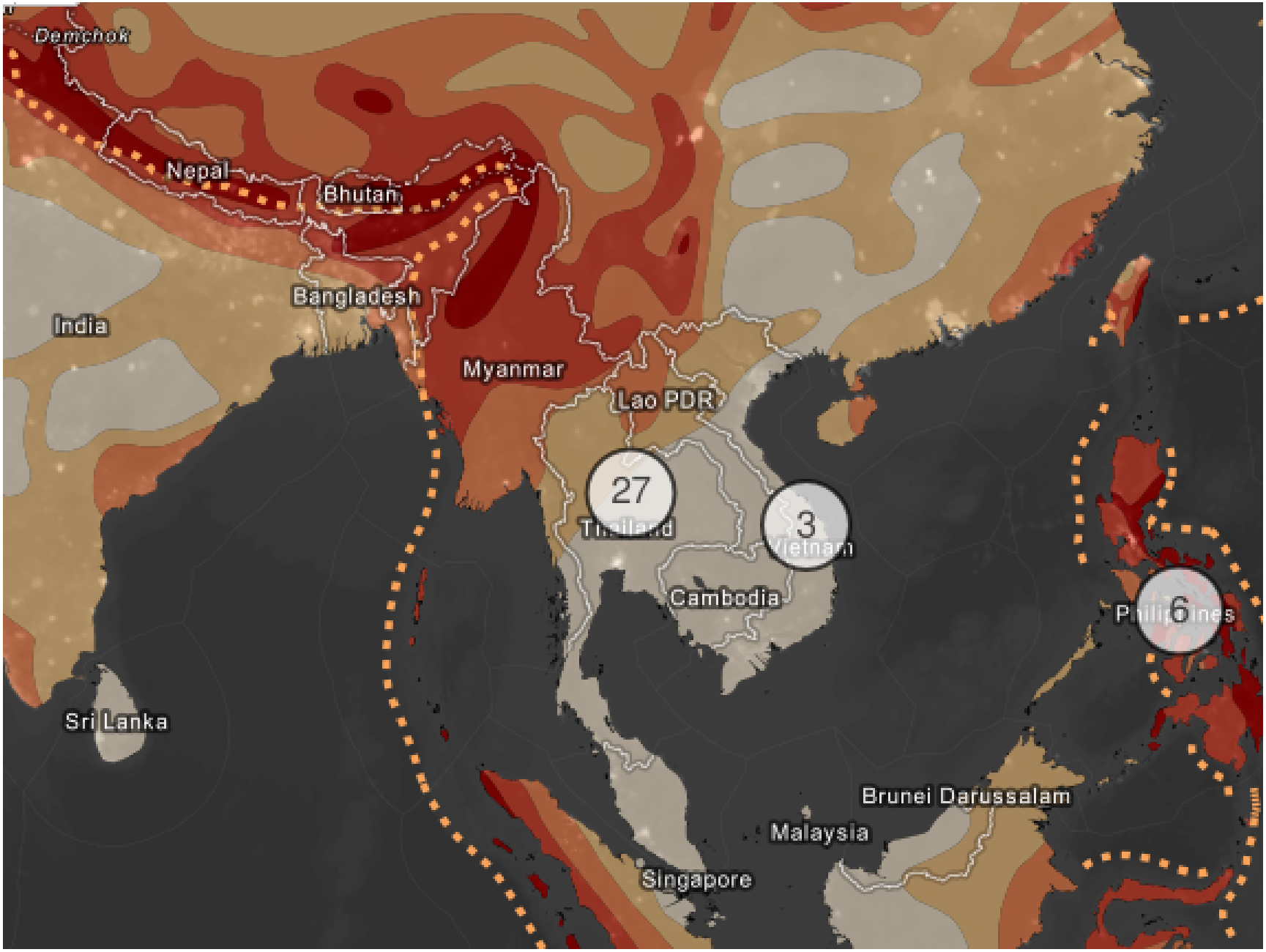
Contemporary web cartography

- automatic on-the-fly map generation
- using metalanguage to define the map style
- map embedded data
- standard mapping tools
  - point, line, polygon, labelling
  - line pattern, polygon pattern, markers, shields, buildings
- advanced mapping tools
  - 'photoshop' like layer composition
  - automatic 'graphic' generalization

Simple web map style

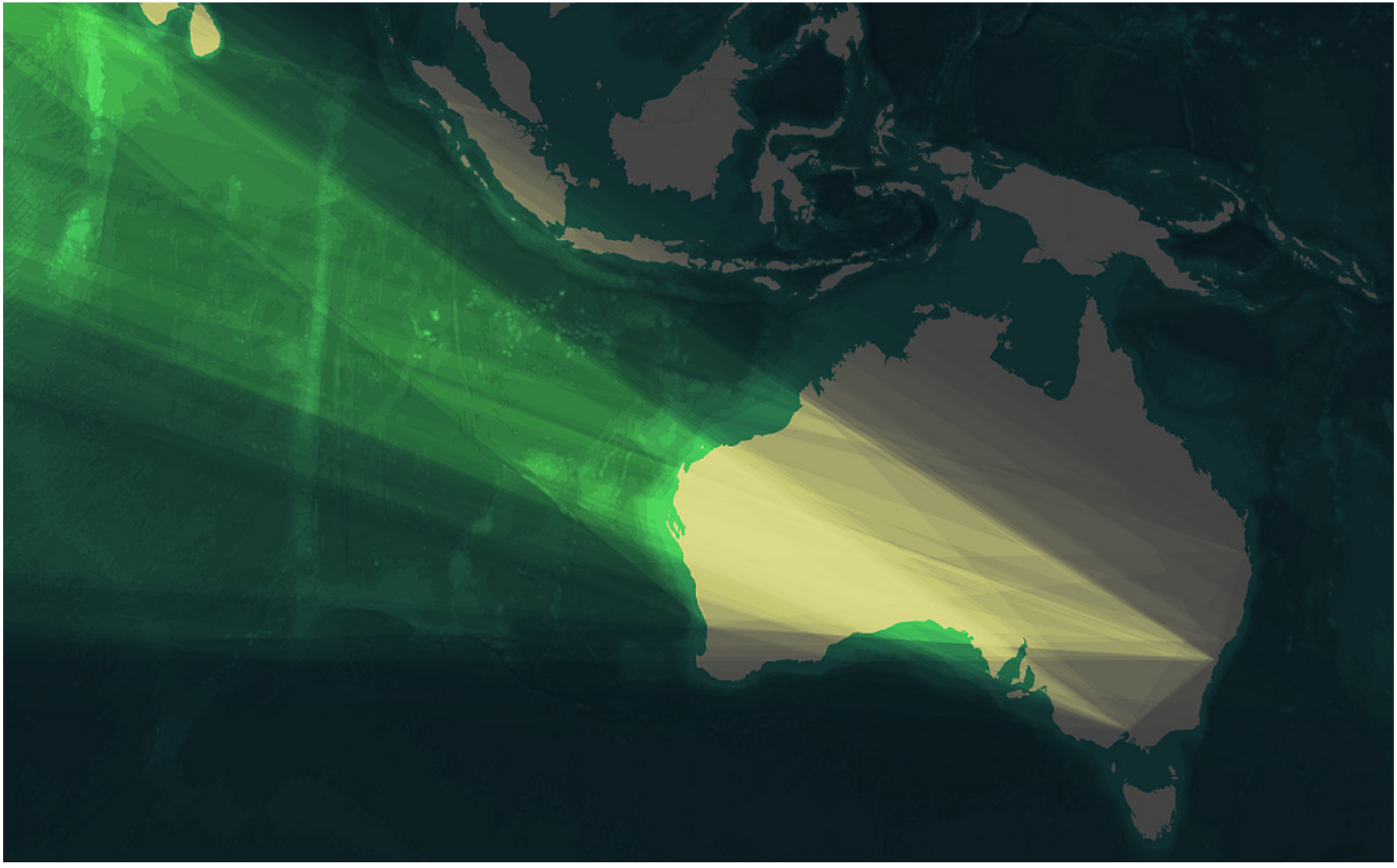


Simple web map style



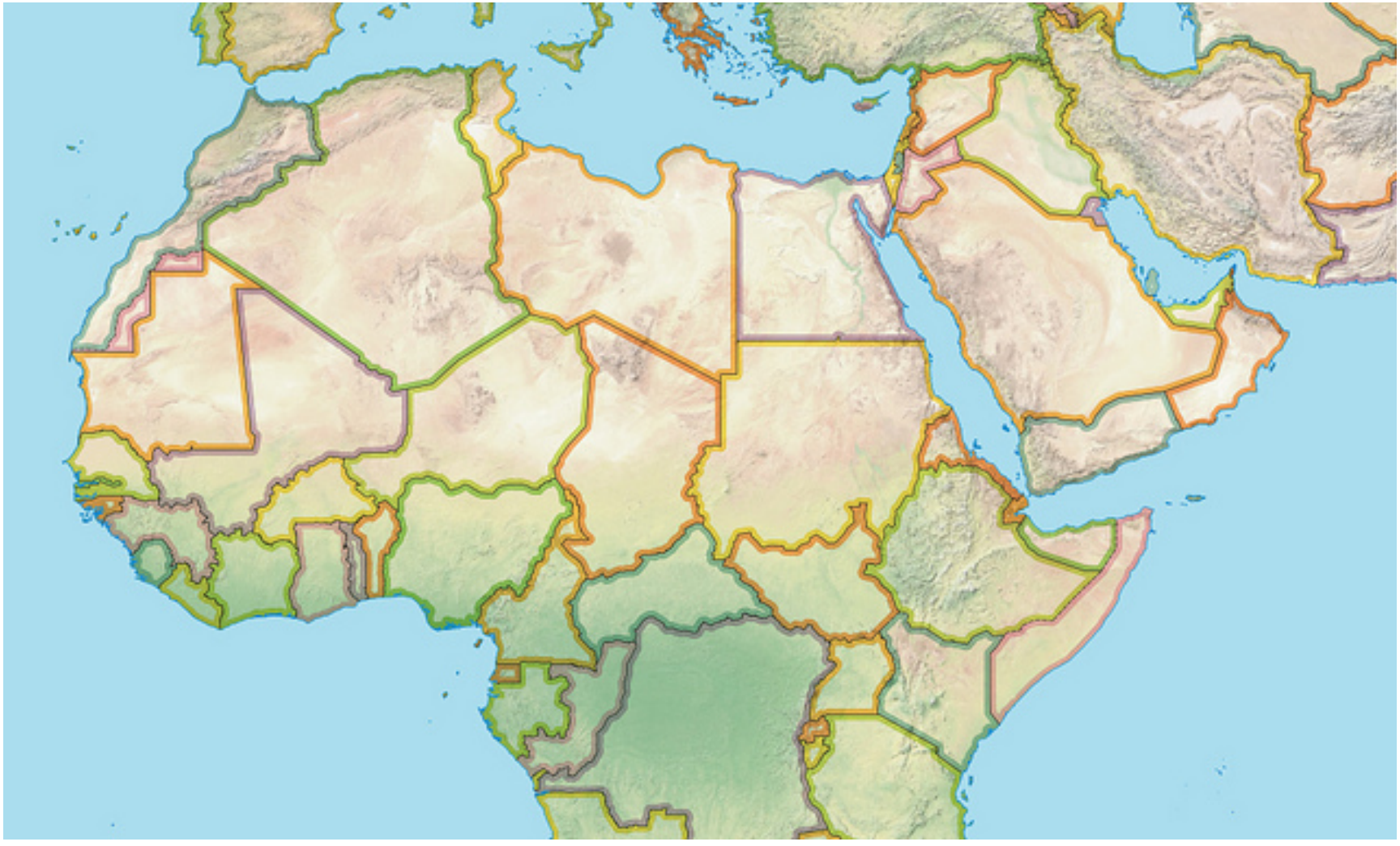
Simple web map style

Advanced web map style



Advanced web map style

Advanced web map style



Advanced web map style

Advanced web map style

OpenGeoData revolution

Quote from Mayan Atlas:

Maps are **power**. Either you will map or you will be mapped. If you are mapped by those who **desire to own or control** your land and resources, their map will display their justifications for their claims, not yours.

THE STRUGGLE TO PRESERVE MAYA LAND IN SOUTHERN BELIZE

a project of the Mayan People of Southern Belize in cooperation with Toledo Maya Cultural Council - Toledo Alealdes Association and U.C. Berkeley Geography Department and GeoMap

OpenStreetMap

- a project that provides free and open data to anyone who wants it
- ODbL licence

Data stats (Croatia):

- users: 795k (1702)
- nodes: 1.579b (3.533m)
- ways: 149m (327k)
- relations 1.558m (5.983k)
- Data file: planet.osm.bz2 23G (250+G)
- Croatia data file: 52M (677M)

Conclusions and issues

- big technology stack (open source)
- open data pushes technology forward
- cloud services shift focus onto cartography (data handling)
- optimized for monitor display (72/96/+++) dpi (not ready for paper)
- using prerendered tiles (TMS, UTF8Grid)
  - frequent changes require smart tile cache handling
  - real-time data is possible, but requires customized solutions