UNIVERSITAS
GADJAH MADA

May 17, 2024

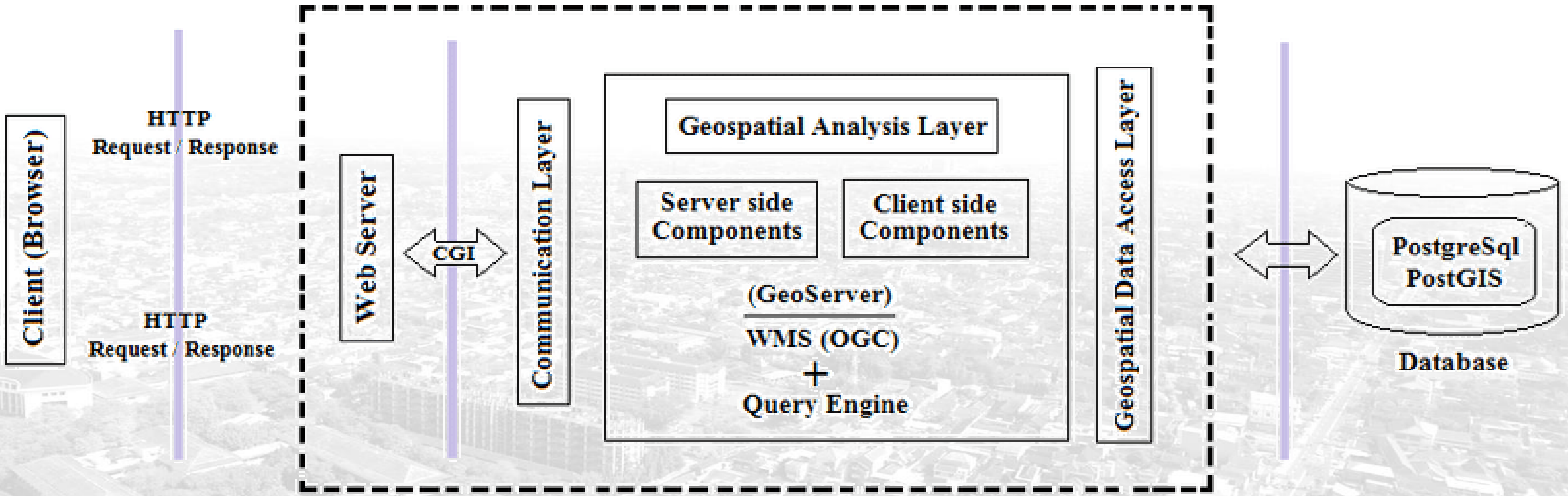
Enterprise FOSS-GIS

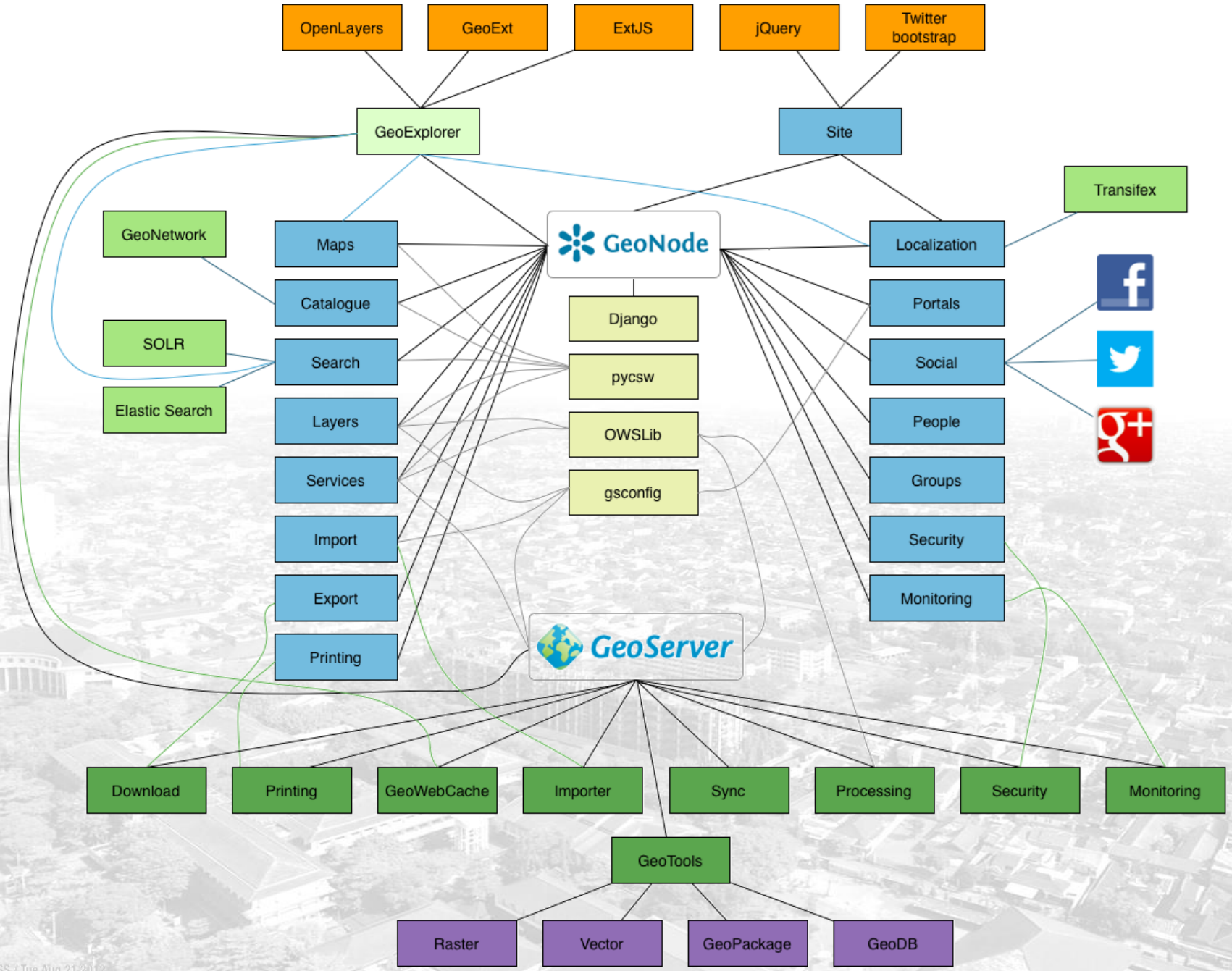
Arsitektur Aplikasi Enterprise FOSS-GIS

Dany Laksono

Departemen Teknik Geodesi UGM

Arsitektur Fullstack WebGIS



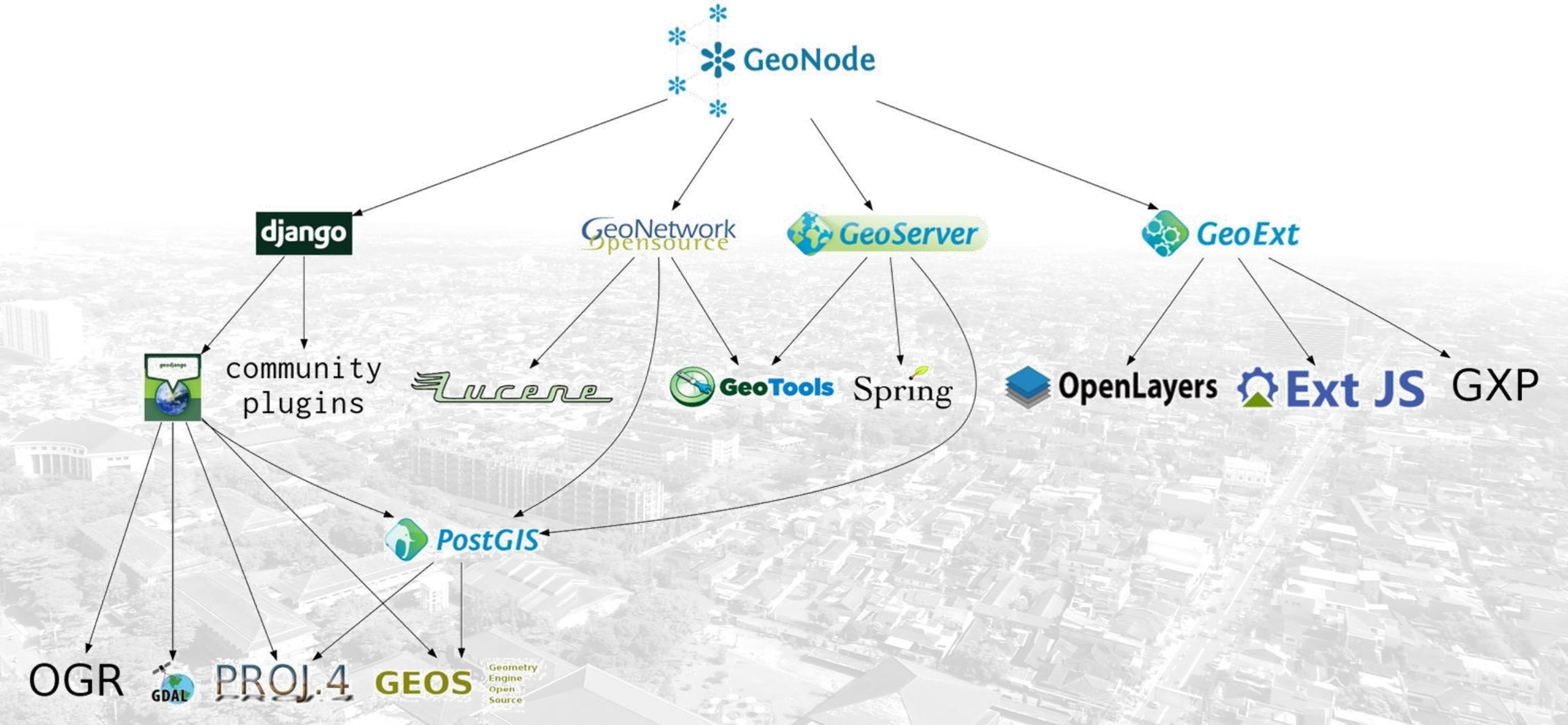


Arsitektur Geoportal: Geonode

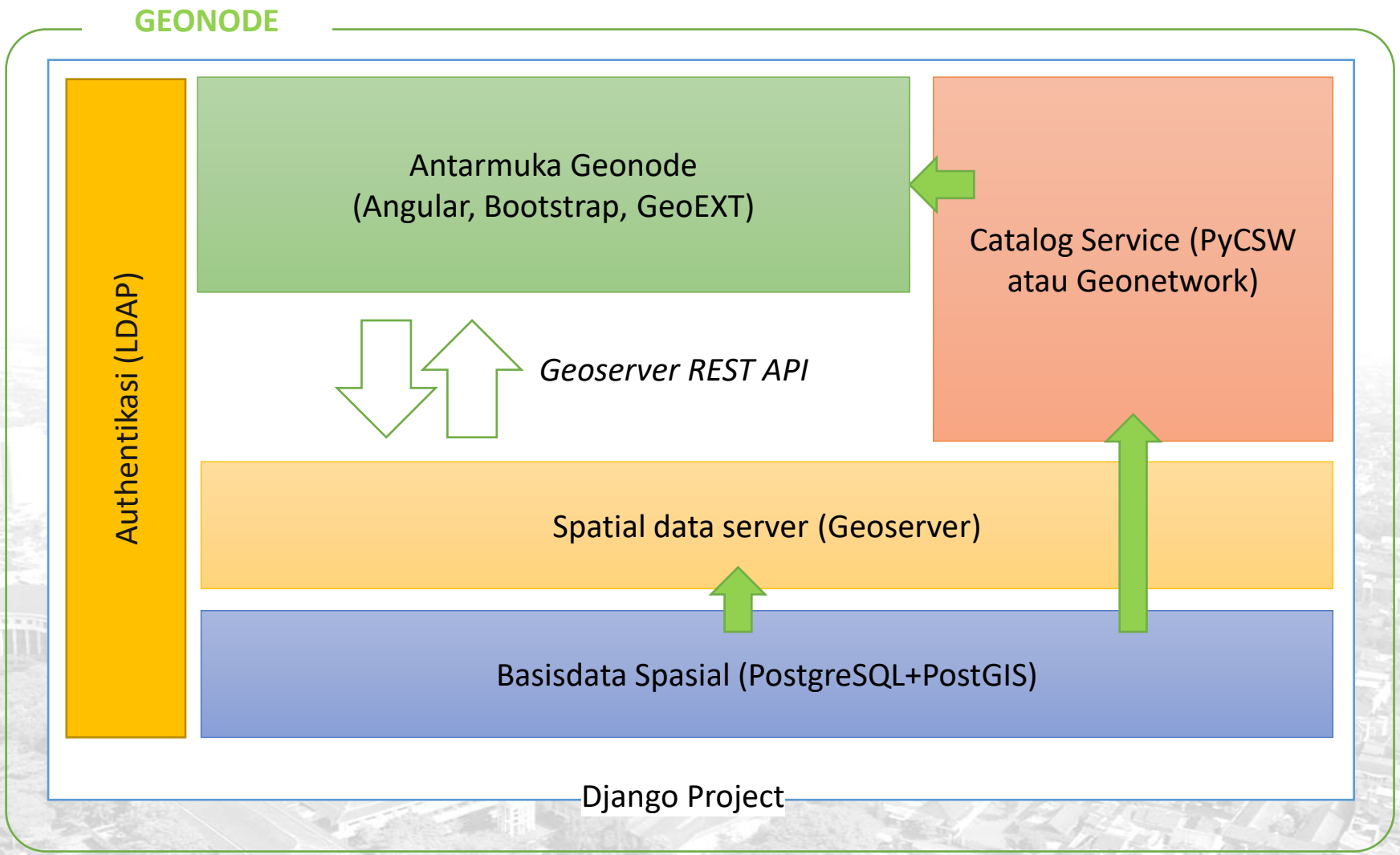
Sebuah Geoportal terdiri dari **banyak komponen yang saling terkait**

Masing-masing komponen mengatur proses bisnis yang berbeda (katalog, map viewer, basisdata spasial, map service, dst)

Arsitektur Geoportal: Geonode



Arsitektur Geoportal: Geonode

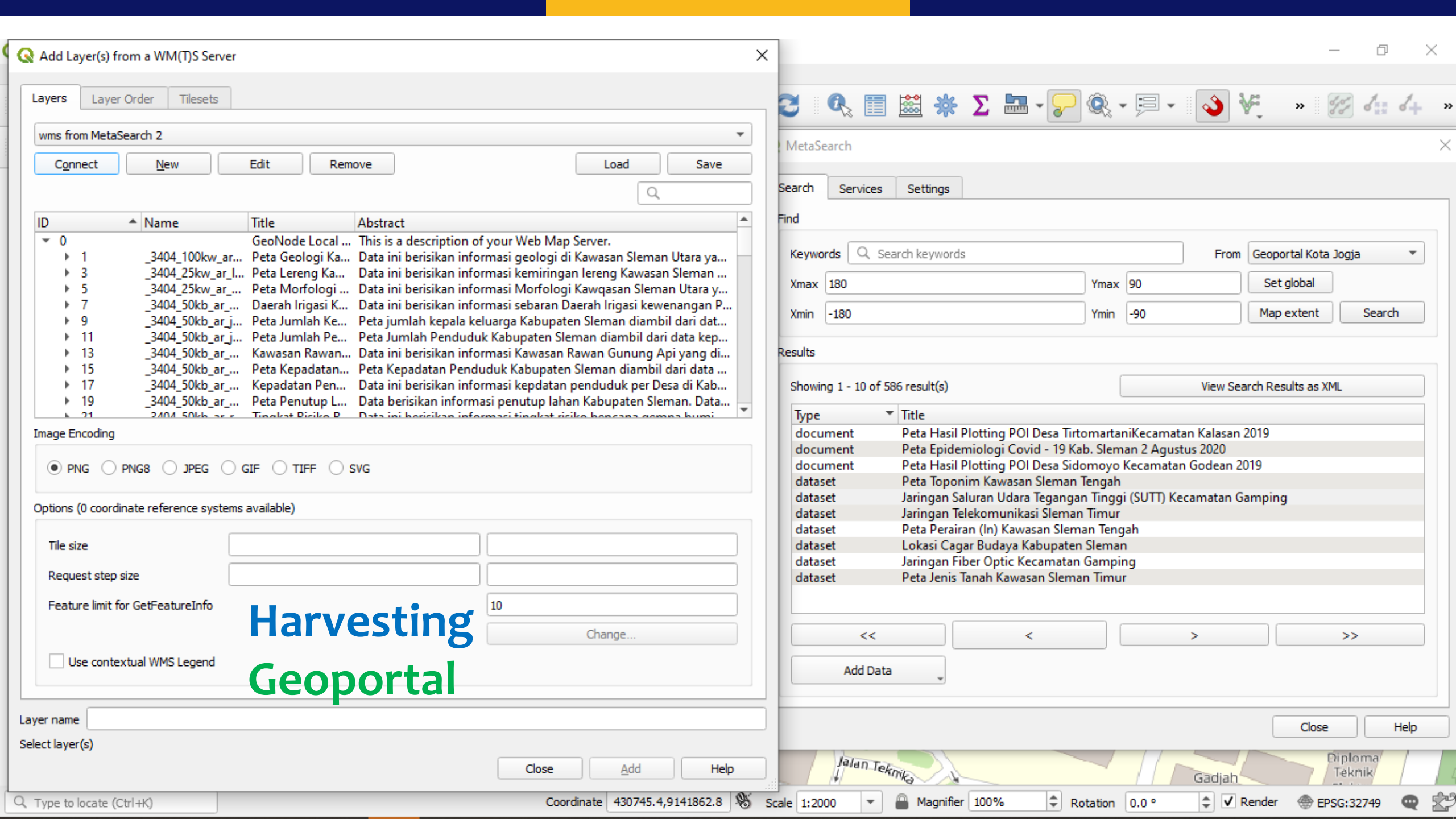


Geonode menggabungkan komponen-komponen komponen **manajemen portal dan data spasial** dalam satu project berbasis **Django**

Arsitektur Geoportal: Geonode

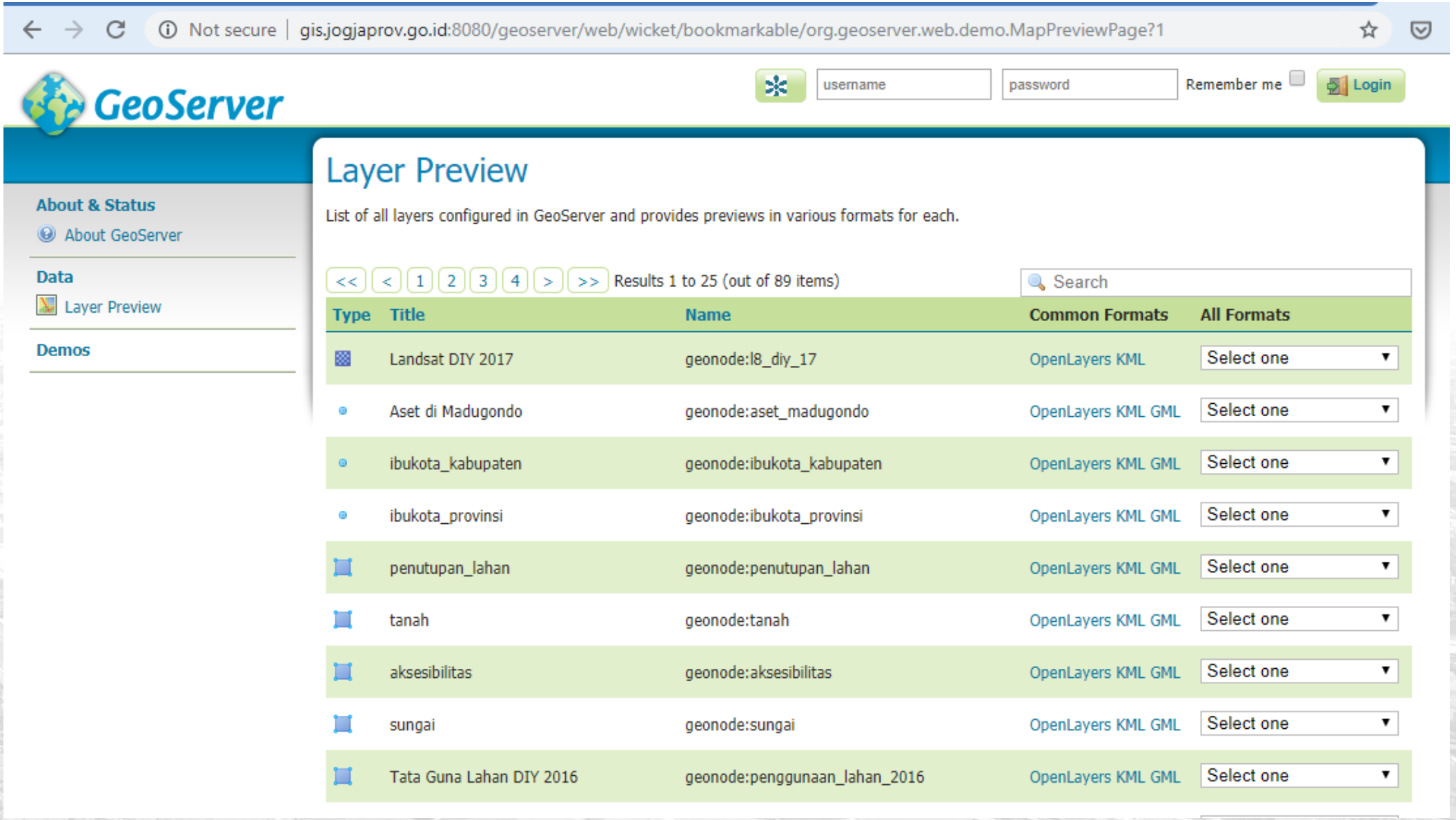
Komponen Geonode

- UI Logic: MVP/MVC based on Django WSGI, Apache
- Metadata manager: pycsw (default), Geonetwork
- Spatial data server: Geoserver (default), ArcGIS server
- Spatial DBMS: PostGIS/PostgreSQL (default), MySQL, Oracle Spatial, MS SQL, ArcSDE
- Protocol: OGC Standards (WMS, WFS/WFS-T, WCS, CSW, TMS, etc)

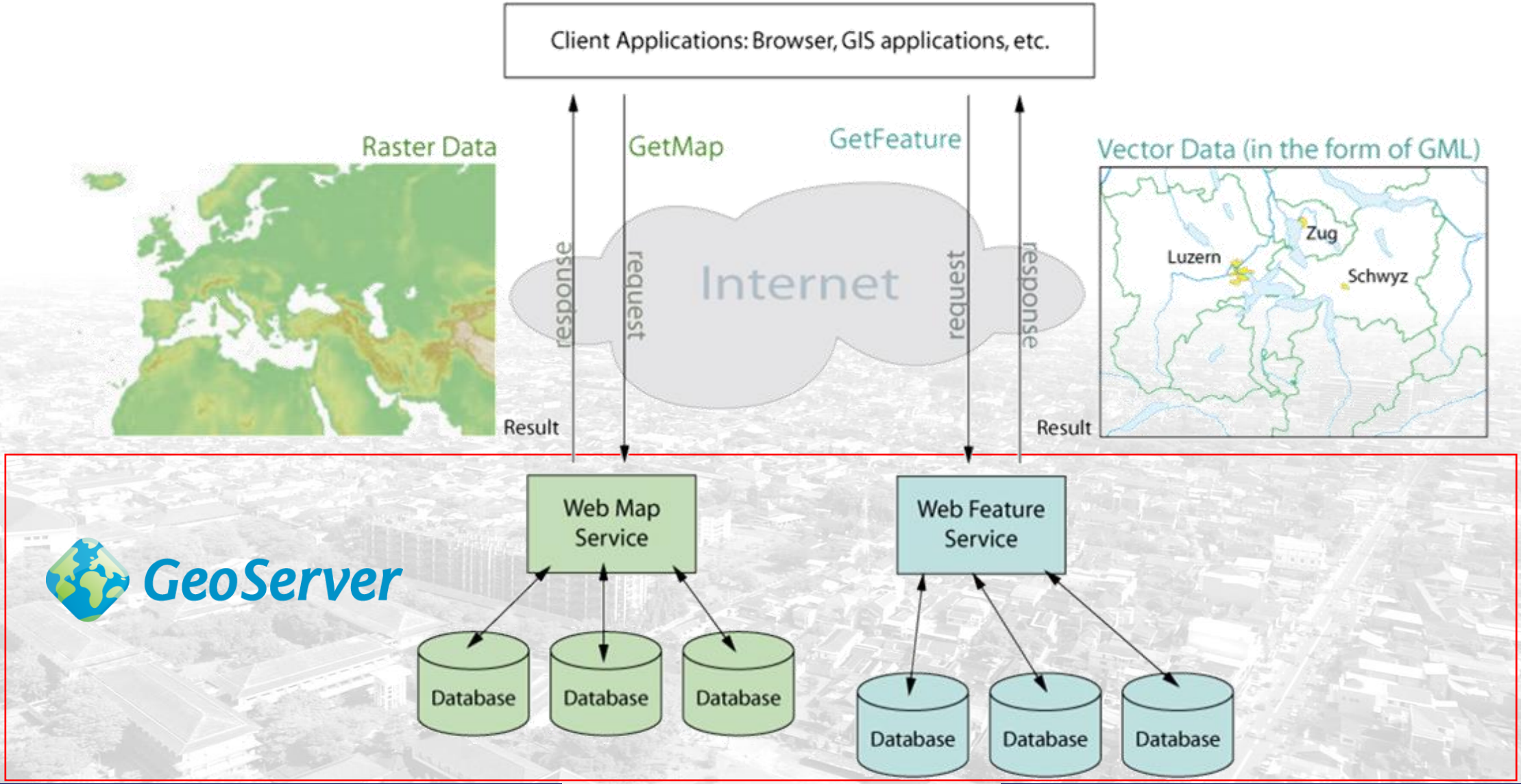

Add Layer(s) from a WM(T)S Server
Layers
Layer Order
Tilesets
wms from MetaSearch 2
Connect
New
Edit
Remove
Load
Save
ID
Name
Title
Abstract
0
GeoNode Local ...
This is a description of your Web Map Server.
1
_3404_100kw_ar...
Peta Geologi Ka...
Data ini berisikan informasi geologi di Kawasan Sleman Utara ya...
3
_3404_25kw_ar_l...
Peta Lereng Ka...
Data ini berisikan informasi kemiringan lereng Kawasan Sleman ...
5
_3404_25kw_ar_...
Peta Morfologi ...
Data ini berisikan informasi Morfologi Kawqasan Sleman Utara y...
7
_3404_50kb_ar_...
Daerah Irigasi K...
Data ini berisikan informasi sebaran Daerah Irigasi kewenangan P...
9
_3404_50kb_ar_j...
Peta Jumlah Ke...
Peta jumlah kepala keluarga Kabupaten Sleman diambil dari dat...
11
_3404_50kb_ar_j...
Peta Jumlah Pe...
Peta Jumlah Penduduk Kabupaten Sleman diambil dari data kep...
13
_3404_50kb_ar_...
Kawasan Rawan...
Data ini berisikan informasi Kawasan Rawan Gunung Api yang di...
15
_3404_50kb_ar_...
Peta Kepadatan...
Peta Kepadatan Penduduk Kabupaten Sleman diambil dari data ...
17
_3404_50kb_ar_...
Kepadatan Pen...
Data ini berisikan informasi kepdatan penduduk per Desa di Kab...
19
_3404_50kb_ar_...
Peta Penutup L...
Data berisikan informasi penutup lahan Kabupaten Sleman. Data...
Image Encoding
PNG
PNG8
JPEG
GIF
TIFF
SVG
Options (0 coordinate reference systems available)
Tile size
Request step size
Feature limit for GetFeatureInfo
10
Change...
Use contextual WMS Legend
Harvesting
Geoportal
Layer name
Select layer(s)
Close
Add
Help
MetaSearch
Search
Services
Settings
Find
Keywords
Search keywords
From
Geoportal Kota Jogja
Xmax
180
Ymax
90
Set global
Xmin
-180
Ymin
-90
Map extent
Search
Results
Showing 1 - 10 of 586 result(s)
View Search Results as XML
Type
Title
document
Peta Hasil Plotting POI Desa TirtomartaniKecamatan Kalasan 2019
document
Peta Epidemiologi Covid - 19 Kab. Sleman 2 Agustus 2020
document
Peta Hasil Plotting POI Desa Sidomoyo Kecamatan Godean 2019
dataset
Peta Toponim Kawasan Sleman Tengah
dataset
Jaringan Saluran Udara Tegangan Tinggi (SUTT) Kecamatan Gamping
dataset
Jaringan Telekomunikasi Sleman Timur
dataset
Peta Perairan (In) Kawasan Sleman Tengah
dataset
Lokasi Cagar Budaya Kabupaten Sleman
dataset
Jaringan Fiber Optic Kecamatan Gamping
dataset
Peta Jenis Tanah Kawasan Sleman Timur
<<
<
>
>>
Add Data
Close
Help
Jalan Teknika
Gadjah
Diploma
Teknik
Type to locate (Ctrl+K)
Coordinate
430745.4,9141862.8
Scale
1:2000
Magnifier
100%
Rotation
0.0 °
Render
EPSG:32749

External Map Viewer

Spatial Data Server



Interoperabilitas Data Spasial



Protokol Layanan Data Spasial

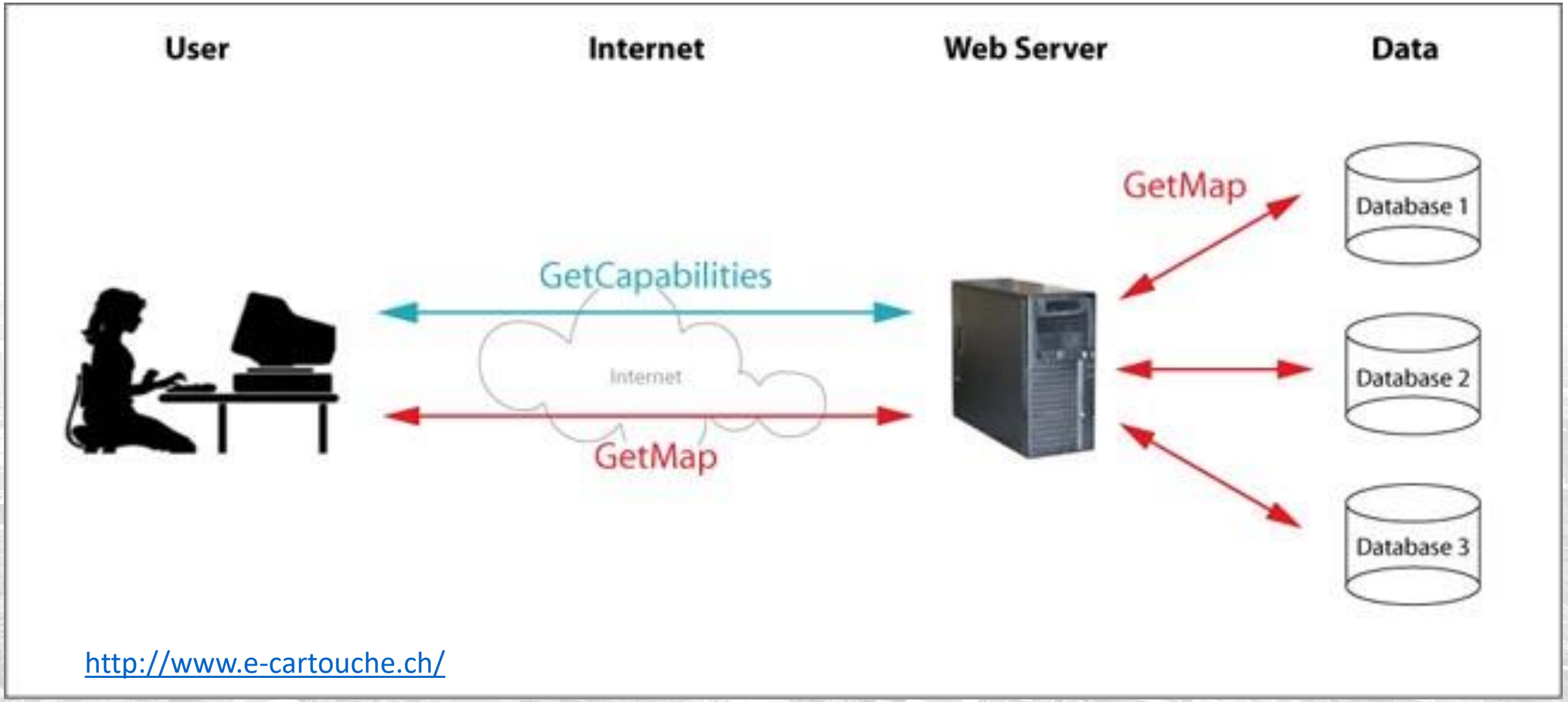
Standar Layanan Data Spasial untuk Interoperabilitas

A **Web Map Service** (**WMS**) is a standard **protocol** for serving georeferenced **map images** over the Internet that are generated by a map server using data from a GIS database

Web Feature Service Interface Standard (**WFS**) provides an interface allowing requests for **geographical features** across the web using platform-independent calls

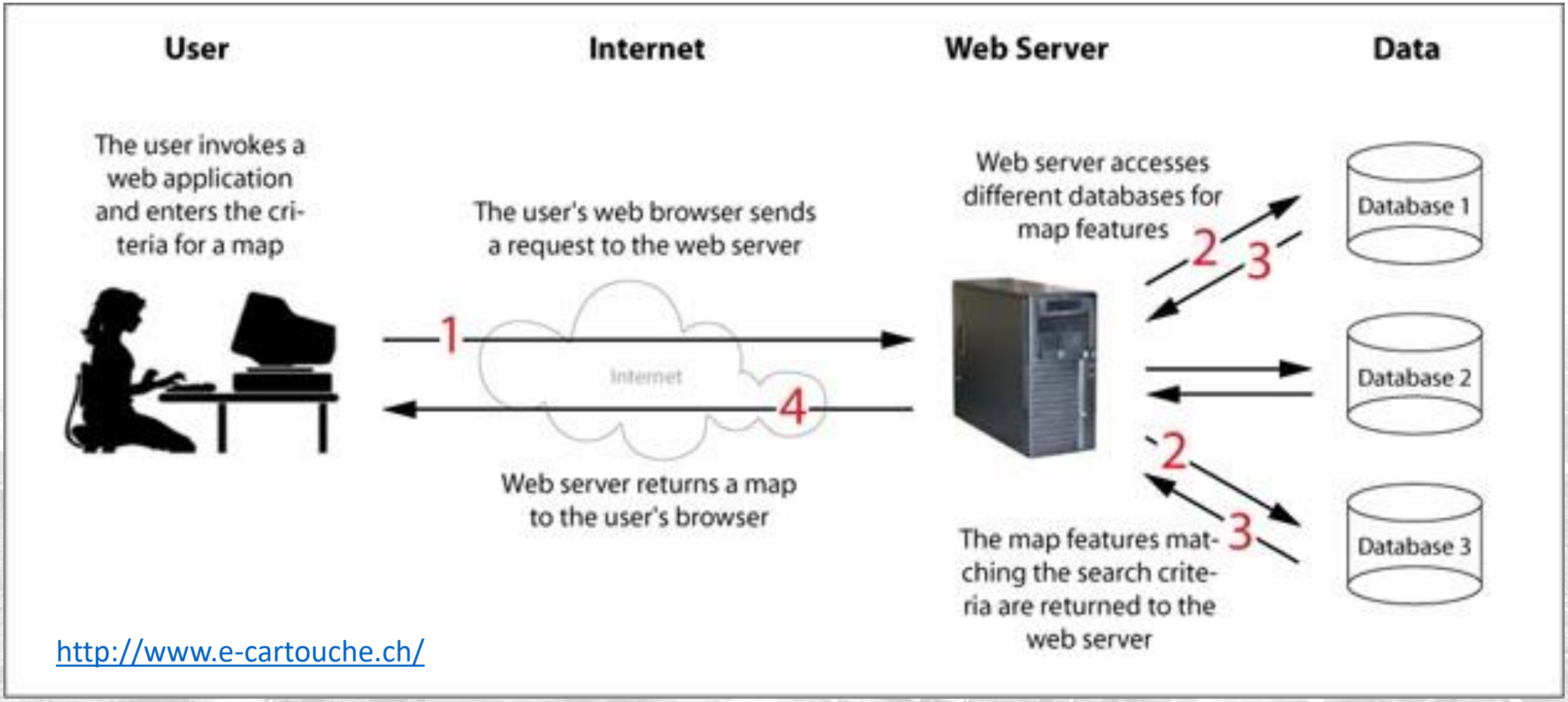
Web Coverage Service Interface Standard (**WCS**) defines Web-based retrieval of **coverages** – that is, digital geospatial information representing space/time-varying phenomena

How WMS Works



http://www.e-cartouche.ch/

How WMS Works



http://www.e-cartouche.ch/

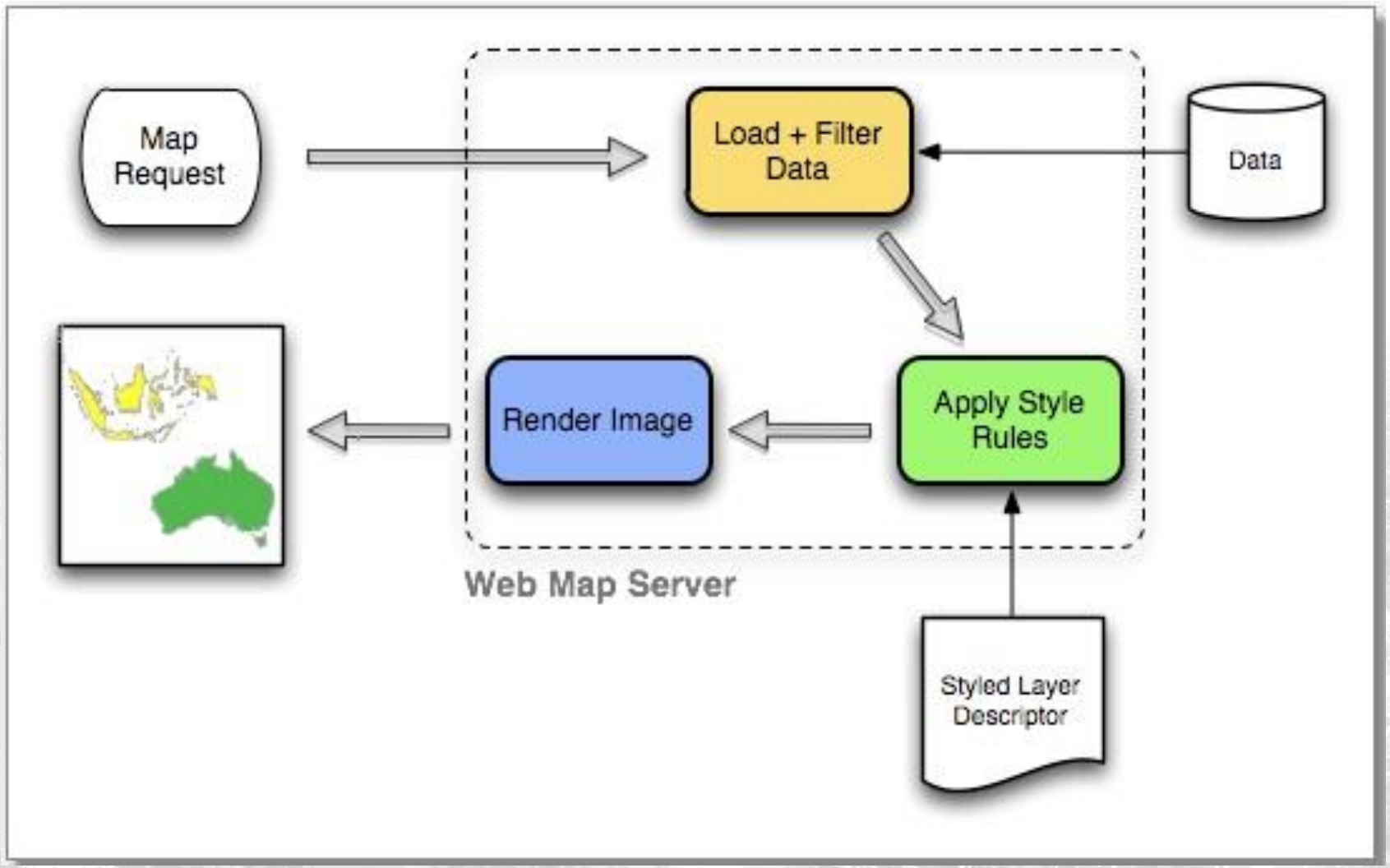
How WMS Works

In particular WMS defines the following *operations*:

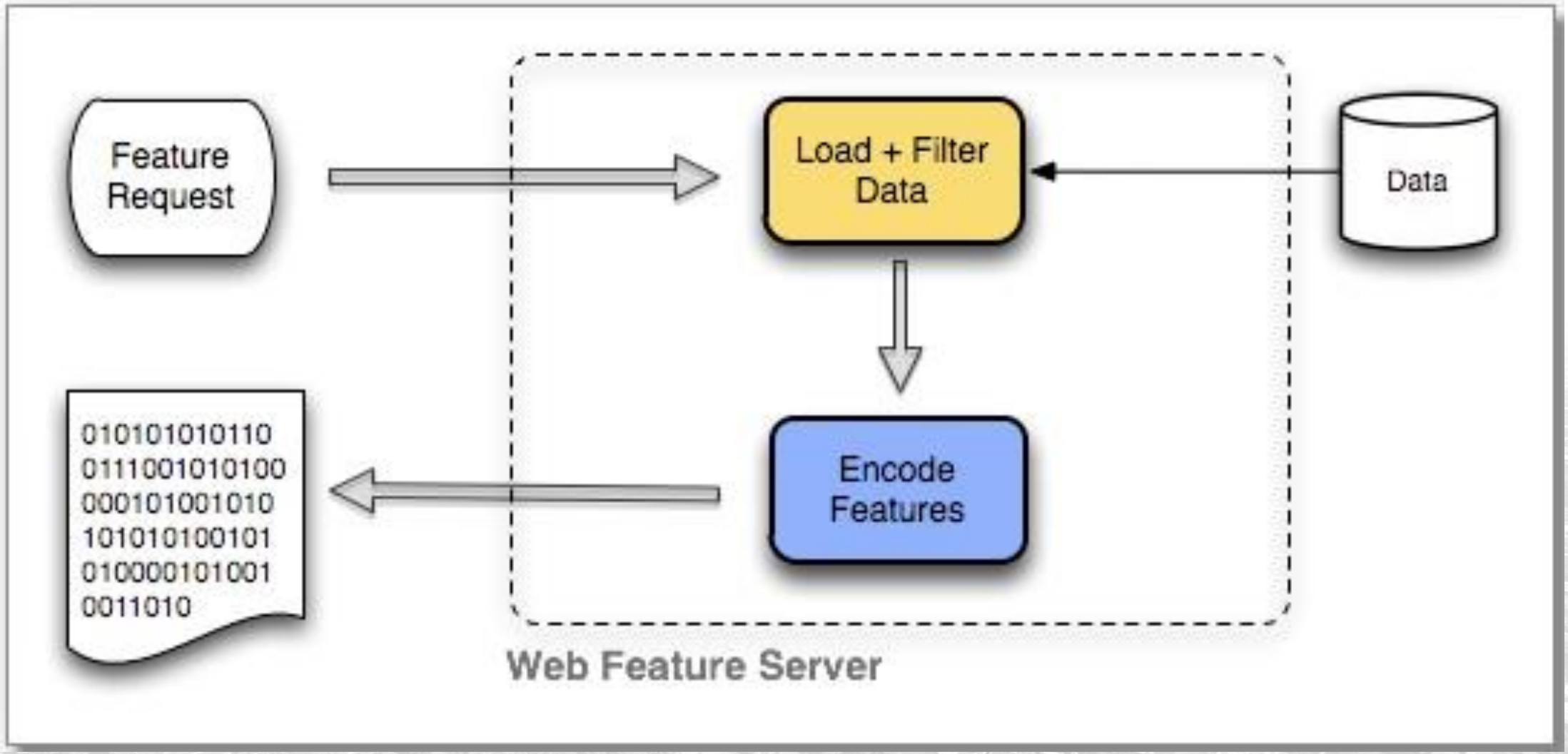
1) How to get and provide information about what types of maps a server can deliver (**GetCapabilities**)
2) How to request and provide a map as a picture or set of features (**GetMap**)
3) How to get and provide information about the content of a map such as the value of a feature at a location (**GetFeatureInfo**)

http://www.e-cartouche.ch/

How WMS Works



How WFS Works



Pengaturan Geoserver: Cek Capabilities

localhost:8080/geoserver/ows?service=WCS&version=2.0.1&request=GetCapabilities

This XML file does not appear to have any style information associated with it. The document tree is shown below.


```
<wcs:Capabilities xmlns:wcs="http://www.opengis.net/wcs/2.0" xmlns:ows="http://www.opengis.net/ows/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
 xmlns:gmlcov="http://www.opengis.net/gmlcov/1.0" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns:wcscrs="http://www.opengis.net/wcs/service-extension/crs/1.0" xmlns:int="http://www.opengis.net/WCS_service-extension_interpolation/1.0" version="2.0.1" upd
 xsi:schemaLocation=" http://www.opengis.net/wcs/2.0 http://schemas.opengis.net/wcs/2.0/wcsGetCapabilities.xsd">
  <ows:ServiceIdentification>
    <ows:Title>Web Coverage Service</ows:Title>
    <ows:Abstract>
      This server implements the WCS specification 1.0 and 1.1.1, it's reference implementation of WCS 1.1.1. All layers published by this service are available o
    </ows:Abstract>
    <ows:Keywords>
      <ows:Keyword>WCS</ows:Keyword>
      <ows:Keyword>WMS</ows:Keyword>
      <ows:Keyword>GEOSERVER</ows:Keyword>
    </ows:Keywords>
    <ows:ServiceType>urn:ogc:service:wcs</ows:ServiceType>
    <ows:ServiceTypeVersion>2.0.1</ows:ServiceTypeVersion>
    <ows:ServiceTypeVersion>1.1.1</ows:ServiceTypeVersion>
    <ows:ServiceTypeVersion>1.1.0</ows:ServiceTypeVersion>
    <ows:Profile>http://www.opengis.net/spec/WCS/2.0/conf/core</ows:Profile>
    <ows:Profile>
      http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0.1
    </ows:Profile>
    <ows:Profile>
      http://www.opengis.net/spec/WCS_protocol-binding_post-xml/1.0
    </ows:Profile>
    <ows:Profile>
      http://www.opengis.net/spec/WCS_service-extension_crs/1.0/conf/crs-gridded-coverage
    </ows:Profile>
    <ows:Profile>
      http://www.opengis.net/spec/WCS_geotiff-coverages/1.0/conf/geotiff-coverage
    </ows:Profile>
    <ows:Profile>
      http://www.opengis.net/spec/GMLCOV/1.0/conf/gml-coverage
    </ows:Profile>
    <ows:Profile>
      http://www.opengis.net/spec/GMLCOV/1.0/conf/special-format
    </ows:Profile>
    <ows:Profile>
      http://www.opengis.net/spec/GMLCOV/1.0/conf/multipart
    </ows:Profile>
```

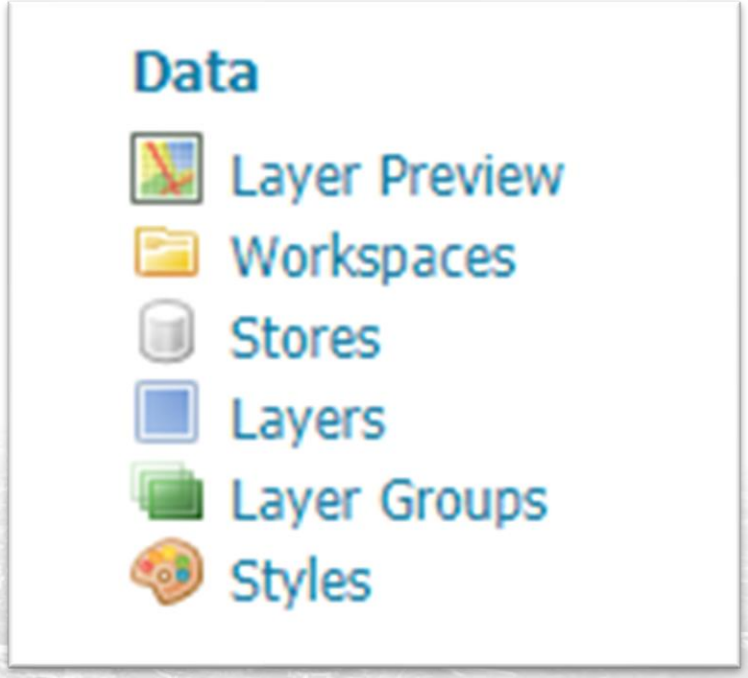

Service Capabilities

- WCS
  - 1.0.0
  - 1.1.0
  - 1.1.1
  - 1.1
  - 2.0.1
- WFS
  - 1.0.0
  - 1.1.0
  - 2.0.0
- WMS
  - 1.1.1
  - 1.3.0
- TMS
  - 1.0.0
- WMS-C
  - 1.1.1
- WMTS
  - 1.0.0

Pengaturan Geoserver: Menambahkan Layer

Menambahkan data pada Geoserver

1. Buat **Workspace** baru (workspace ≈ nama project)
2. Buat **Store** baru sesuai jenis data (vector/raster/cascading). Pilih workspace yang telah dibuat
3. **Publish layer** dengan mengatur extent, proyeksi dan styling
4. **Atur Style** apabila diperlukan
5. Uji Layanan Layer dengan menggunakan **Layer Preview**



Pengaturan Geoserver: Publish Layer

Coordinate Reference Systems

Native SRS

EPSG:32749 WGS_1984_UTM_Zone_49S...

Declared SRS

EPSG:32749 Find... EPSG:WGS 84 / UTM zone 49S...

SRS handling

Force declared

Bounding Boxes

Native Bounding Box

Min X	Min Y	Max X	Max Y
413,535.5625	9,133,697	450,074.4375	9,166,253

Compute from data

Compute from SRS bounds

Lat/Lon Bounding Box

Min X	Min Y	Max X	Max Y
110.21571350062(	-7.8369826005137	110.547446385401	-7.5420324247113

Compute from native bounds

SRS handling

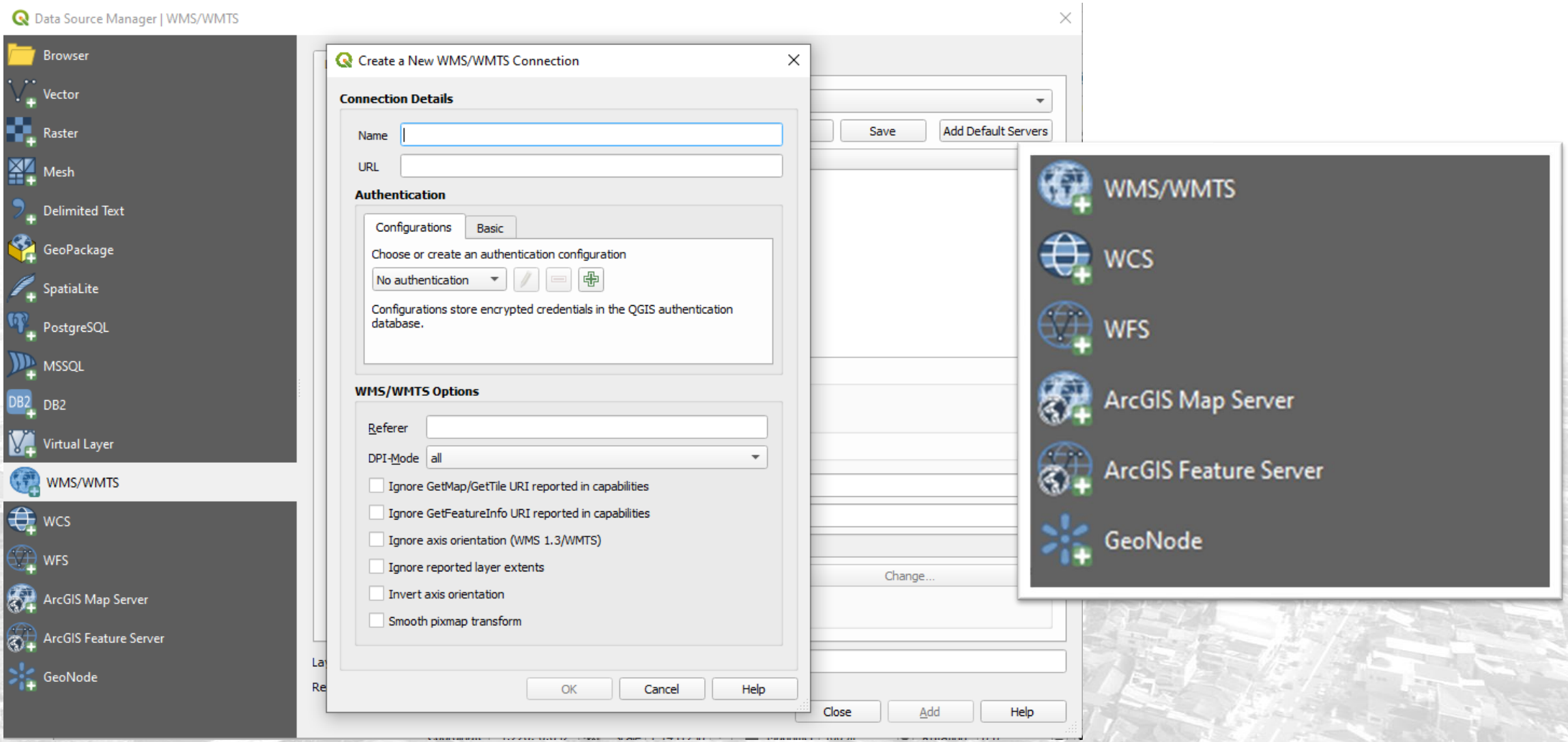
Force declared

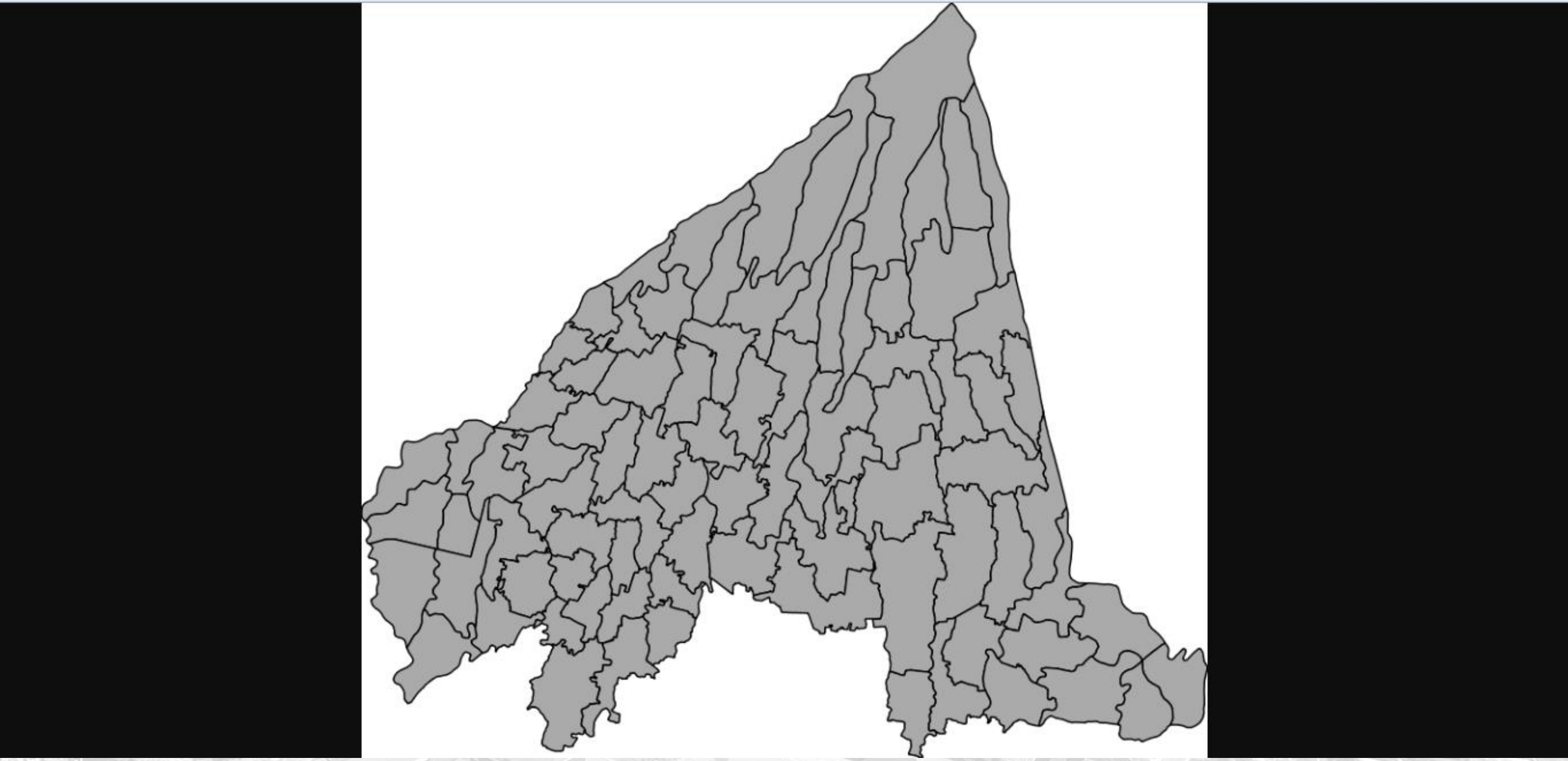
Force declared

Reproject native to declared

Keep native

Memanggil Layer Geoserver pada QGIS



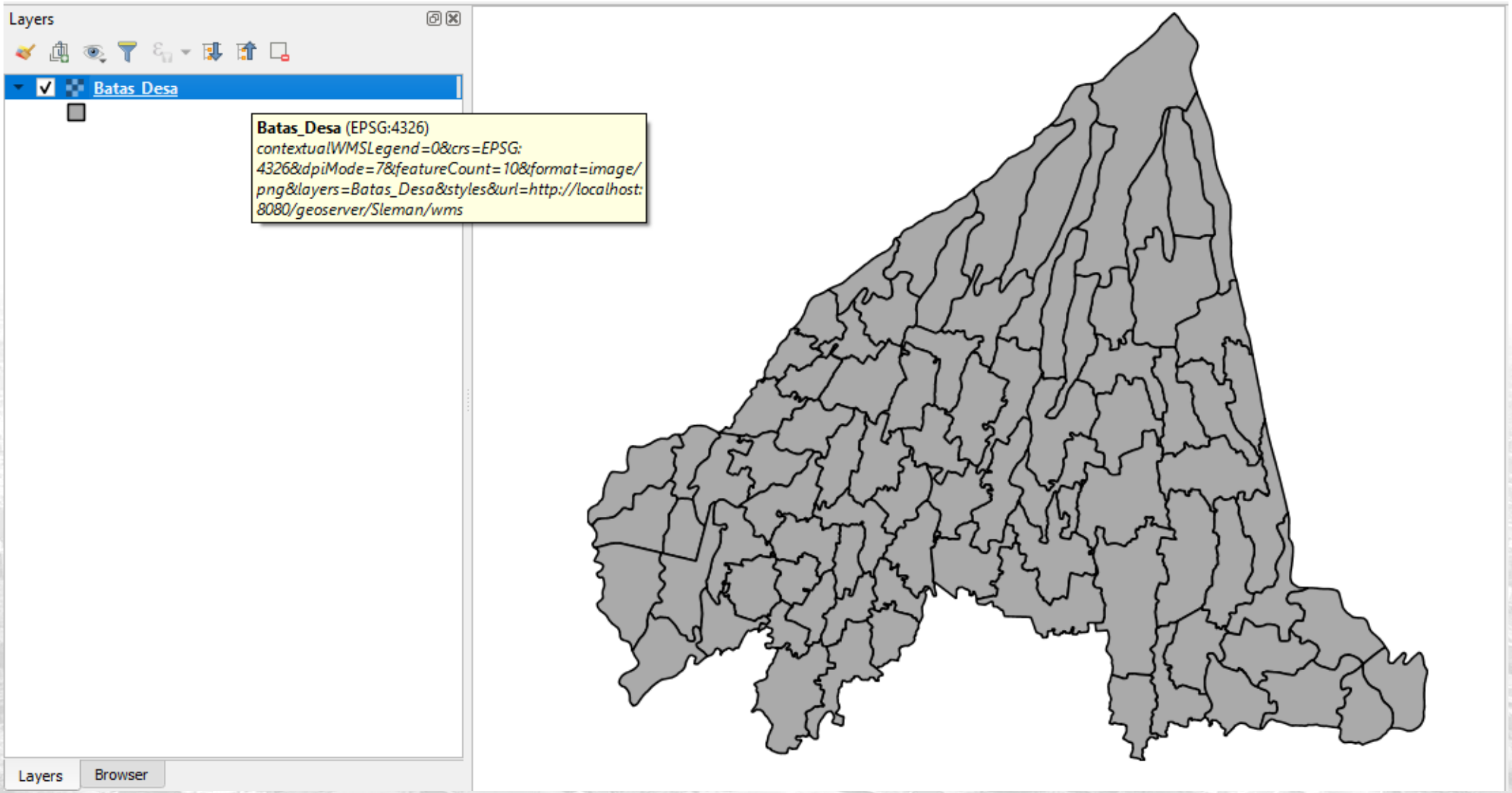

localhost:8080/geoserver/Sleman/wms?service=WMS&version=1.1.0&request=GetMap&layers=Sleman%3ABatas_Desa&bbox=413535.5625...
Paused

Menggunakan Layanan OGC: WMS

WMS Parameter (Key Value Pair)

http://localhost:8080/geoserver/Sleman/wms?
service=WMS
&version=1.1.0
&request=GetMap
&layers=Sleman%3ABatas_Desa
&bbox=413535.5625%2C9133697.0%2C450074.4375%2C9166253.0
&width=768&height=684
&srs=EPSG%3A32749
&format=image%2Fpng

Menggunakan Layanan OGC: WMS

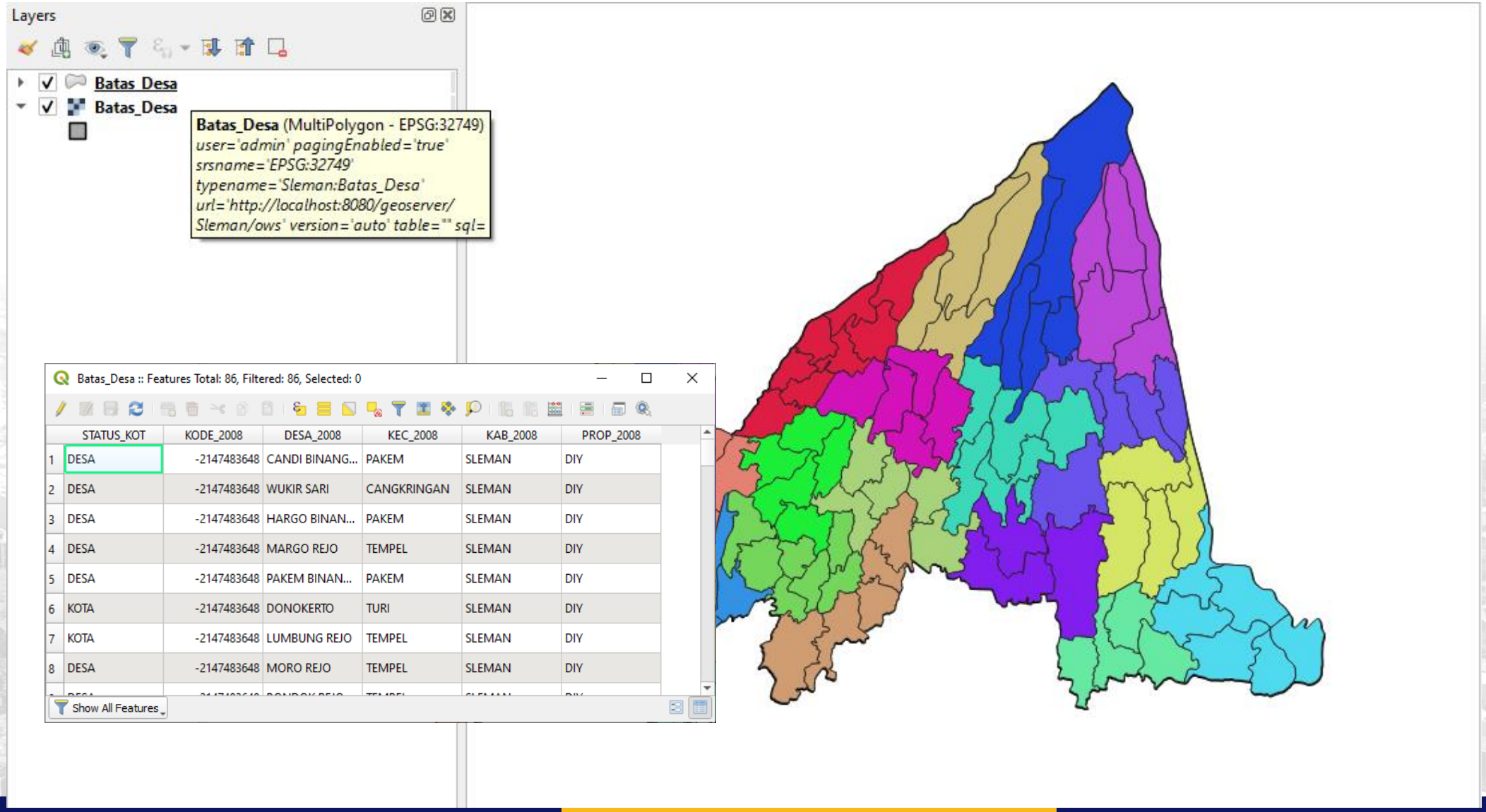


Menggunakan Layanan OGC: WFS

WFS Parameter (Key Value Pair)

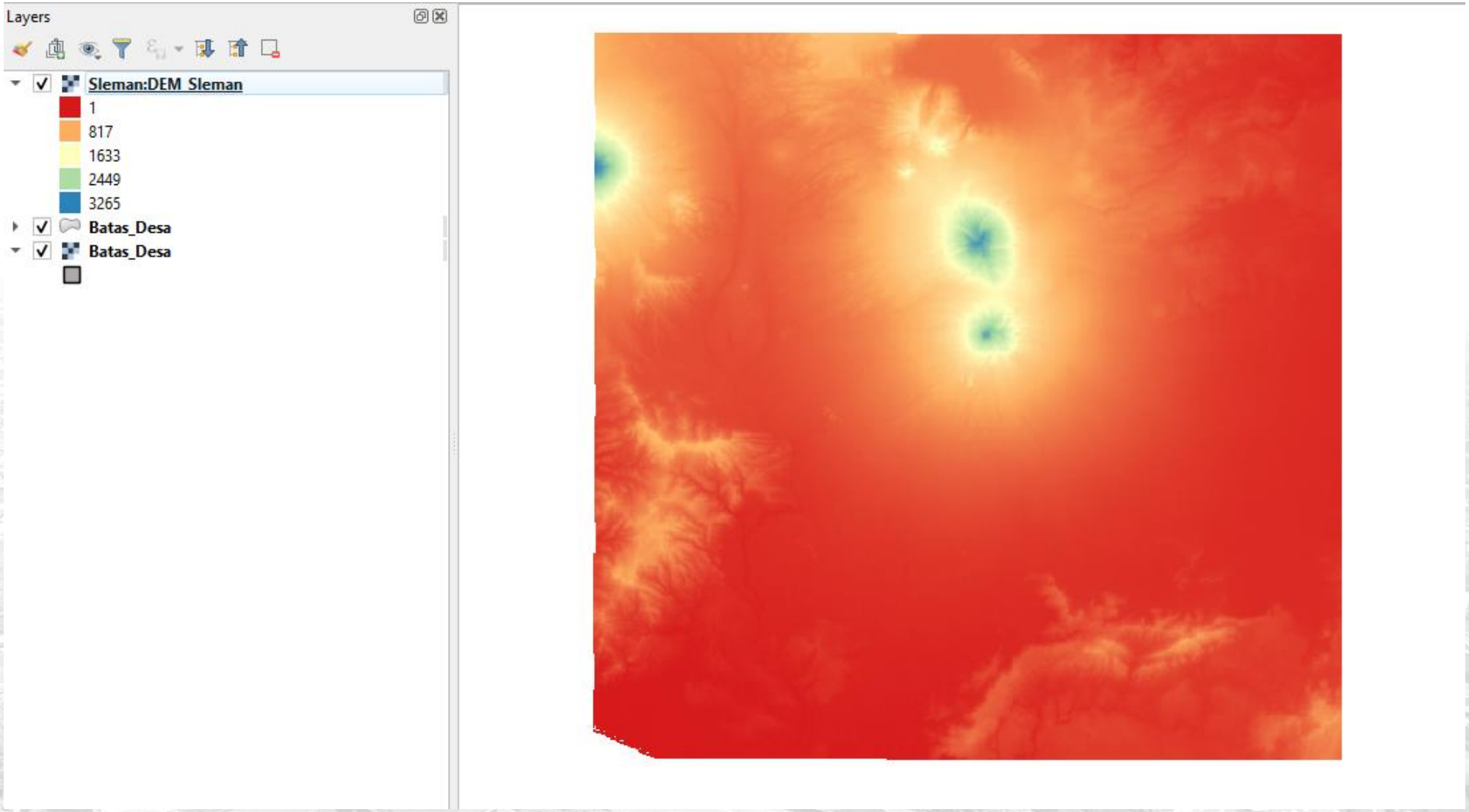
http://localhost:8080/geoserver/Sleman/ows?
service=WFS
&version=1.0.0
&request=GetFeature
&typeName=Sleman%3ABatas_Desa
&maxFeatures=50
&outputFormat=application%2Fgml%2Bxml%3B%20version%3D3.2

Menggunakan Layanan OGC: WFS



	STATUS_KOT	KODE_2008	DESA_2008	KEC_2008	KAB_2008	PROP_2008
1	DESA	-2147483648	CANDI BINANG...	PAKEM	SLEMAN	DIY
2	DESA	-2147483648	WUKIR SARI	CANGKRINGAN	SLEMAN	DIY
3	DESA	-2147483648	HARGO BINAN...	PAKEM	SLEMAN	DIY
4	DESA	-2147483648	MARGO REJO	TEMPEL	SLEMAN	DIY
5	DESA	-2147483648	PAKEM BINAN...	PAKEM	SLEMAN	DIY
6	KOTA	-2147483648	DONOKERTO	TURI	SLEMAN	DIY
7	KOTA	-2147483648	LUMBUNG REJO	TEMPEL	SLEMAN	DIY
8	DESA	-2147483648	MORO REJO	TEMPEL	SLEMAN	DIY

Menggunakan Layanan OGC: WCS



Menggunakan Layanan OGC: Tiling Service

Terdapat tiga macam Tiling Service (Slippy Maps) yang didukung oleh OGC/Geoserver:

1. TMS (Tile Map Service)
2. WMS-C (WMS-Cached)
3. WMTS (Web Map Tile Service)

Selain itu, WMS juga mendukung operasi untuk tiling (‘on-the-fly’ tiling) dengan WMS-T

Menggunakan Layanan OGC: Tiling Service

localhost:8080/geoserver/gwc/rest/seed/Sleman:Guna_Lahan

GeoWebCache

List this Layer tasks (there are no tasks for other Layers)

Kill all Tasks for Layer 'Sleman:Guna_Lahan'. Submit

List of currently executing tasks:

- *none*

Refresh list

Please note:

- This minimalistic interface does not check for correctness.
- Seeding past zoomlevel 20 is usually not recommended.
- Truncating KML will also truncate all KMZ archives.
- Please check the logs of the container to look for error messages and

Here are the max bounds, if you do not specify bounds these will be used.

- EPSG:4326: 110.21571350111506,-7.836982600789105,110.54744
- EPSG:900913: 12269157.104361456,-875142.0341967946,1230608

Create a new task:

Number of tasks to use: 01

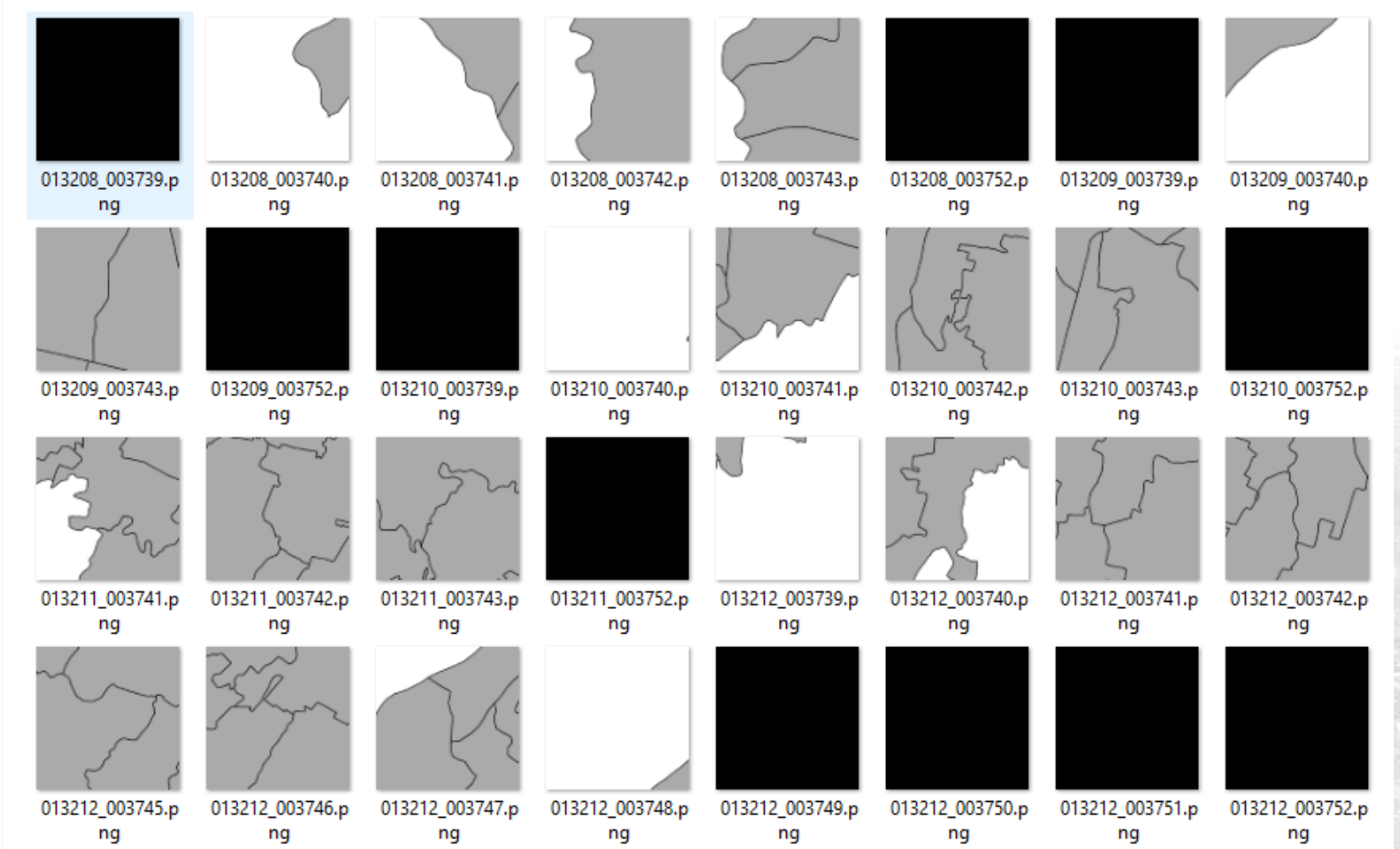
Type of operation: Seed - generate missing tiles

Grid Set: EPSG:4326

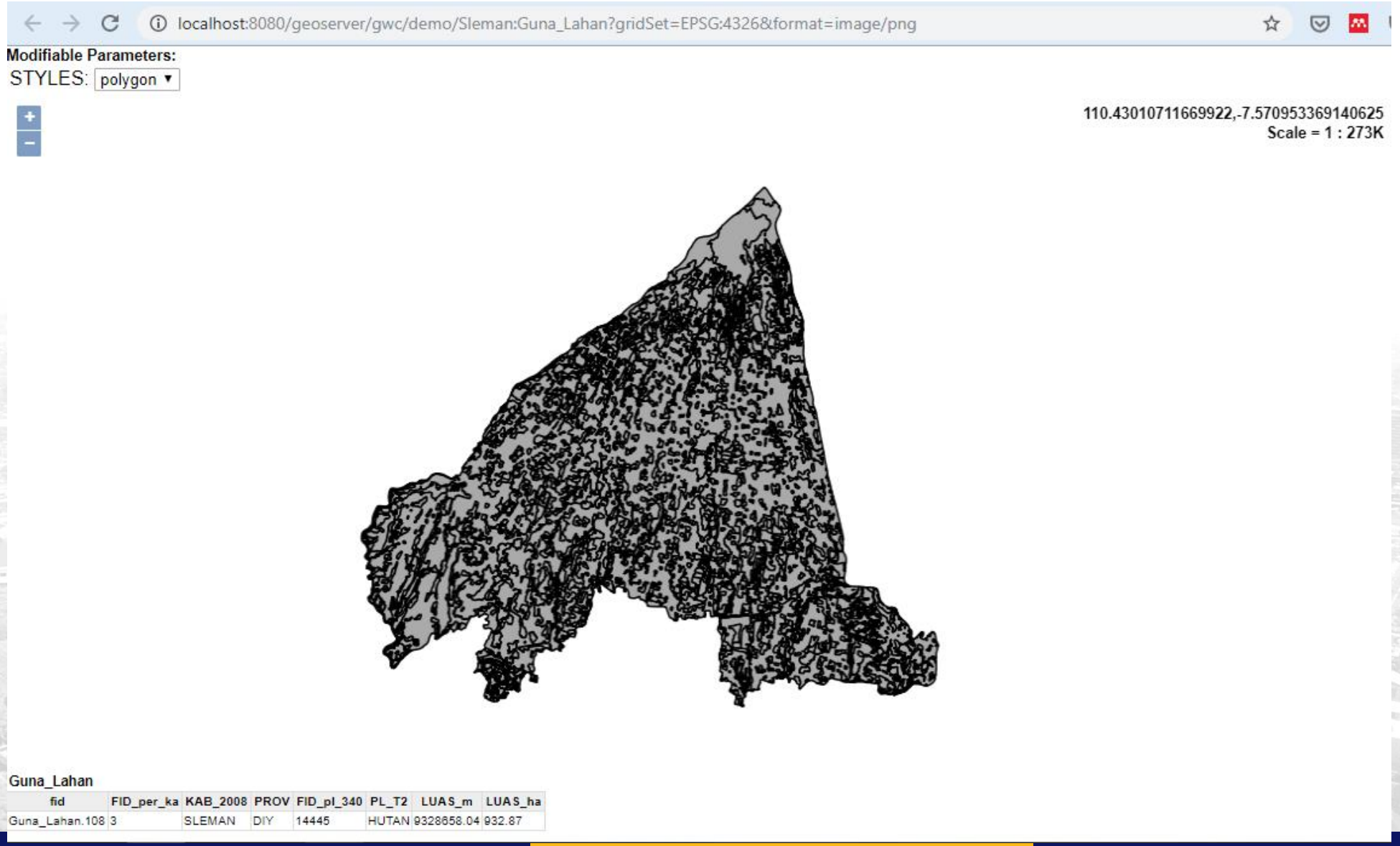
Format: image/png

Zoom start: 00

Windows (C:) › gwc_cache › Sleman_Batas_Desa › EPSG_4326_13 › 103_029



Menggunakan Layanan OGC: Tiling Service (WMTS)



Penggunaan Layanan OGC

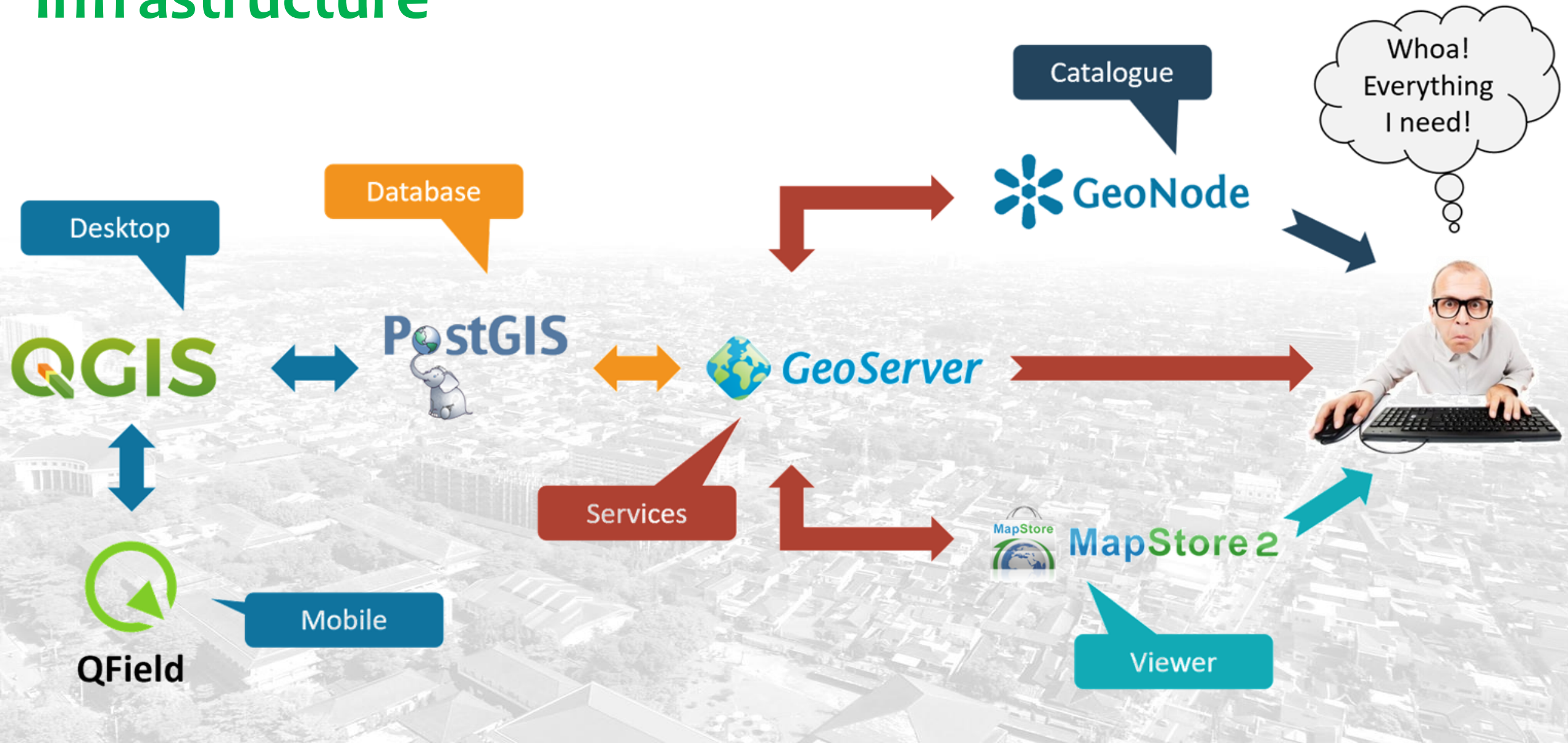
Contoh pemanfaatan layanan OGC untuk interoperabilitas:

WebGIS desa yang memanfaatkan data:

1. WMS Citra SPOT 6 desa dari Badan Informasi Geospasial sebagai latar belakang
2. WMS Batas Desa dari BPS sebagai latar belakang
3. WFS Jaringan Jalan dari PU untuk analisis buffer
4. WFS bangunan desa dari server local untuk simbologi atribut
5. WCS Cuaca terkini dari BMKG

Enterprise Geospatial Information

Infrastructure



Tugas Akhir Mata Kuliah IIG

Buat skenario dan rancangan sistem yang mendemonstrasikan Infrastruktur Informasi Geospasial dalam bentuk:

- Satu buah geoportal nasional
- Minimal satu geoportal node (boleh digunakan geoportal yang sudah ada)
- Masing-masing satu Map Viewer dan Satu Server Data Spasial
- Detil dan panduan teknis tugas menyusul

Arsitektur Infrastruktur Informasi Geospasial

Spatial Data Server Only

GeoServer

Full-Fledge Geoportal

GeoNode

GeoNetwork opensource

Map Viewer Only

MapStore 2

terria

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TERIMA KASIH

LOCALLY ROOTED, GLOBALLY RESPECTED