



PROJ



Revamp of CRS management in the OSGeo C/C++ stack

Even Rouault
SPATIALYS

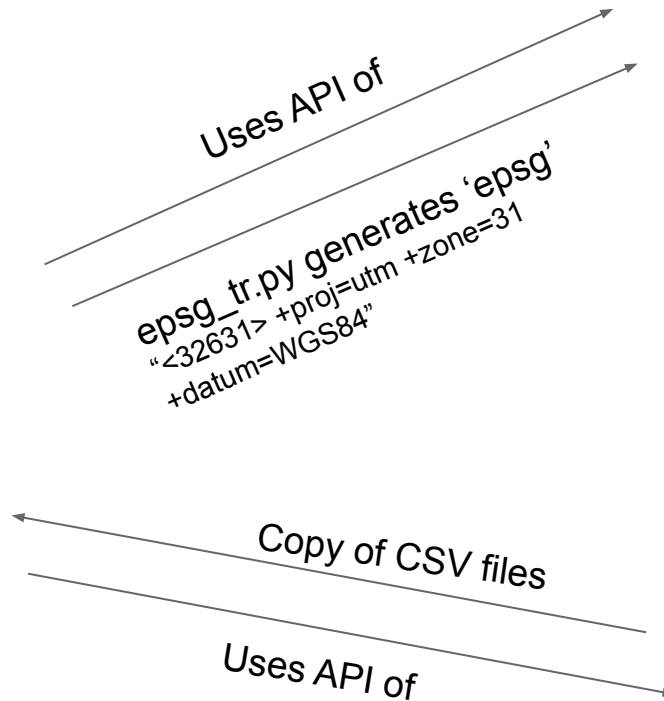
August 28th 2019



Past situation: CRS dictionaries



Many CSV files with
EPSG database
CSV files for ESRI



PROJ

Several text dictionaries:
epsg, IGNF, esri

Uses API
(some services)

libgeotiff

Ingests EPSG database, do
various manipulation and
generates many CSV files

Past situation: coordinate transformation and WGS84 pivot



Source: https://en.wikipedia.org/wiki/File:Good_the_bad_and_the_ugly_poster.jpg

Past situation: coordinate transformation and WGS84 pivot

The good

UTM zone 31 /
WGS84
(EPSG:32631)

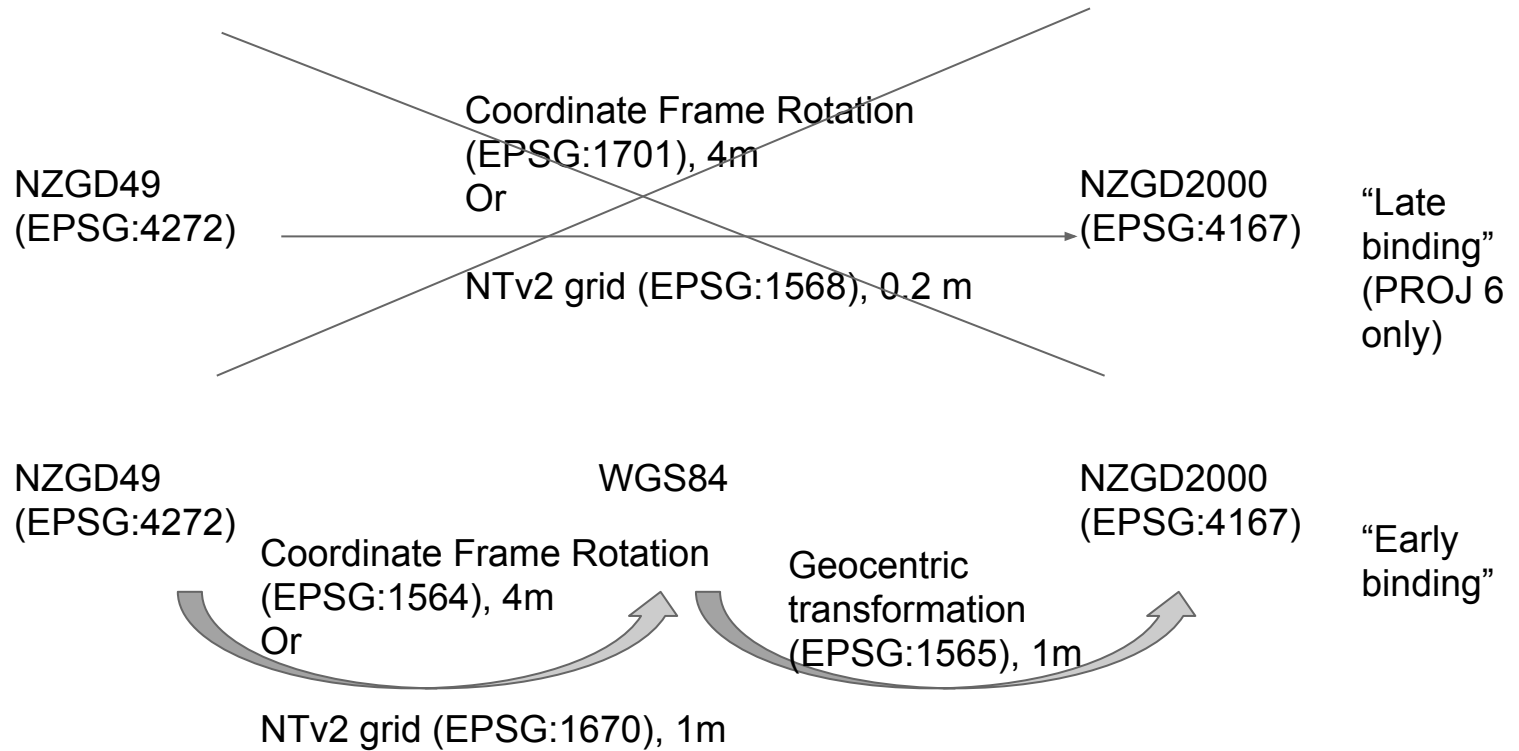
—————→
Inverse map
projection

WGS84 lat/long
(EPSG:4326)

Accuracy: ~ nanometre

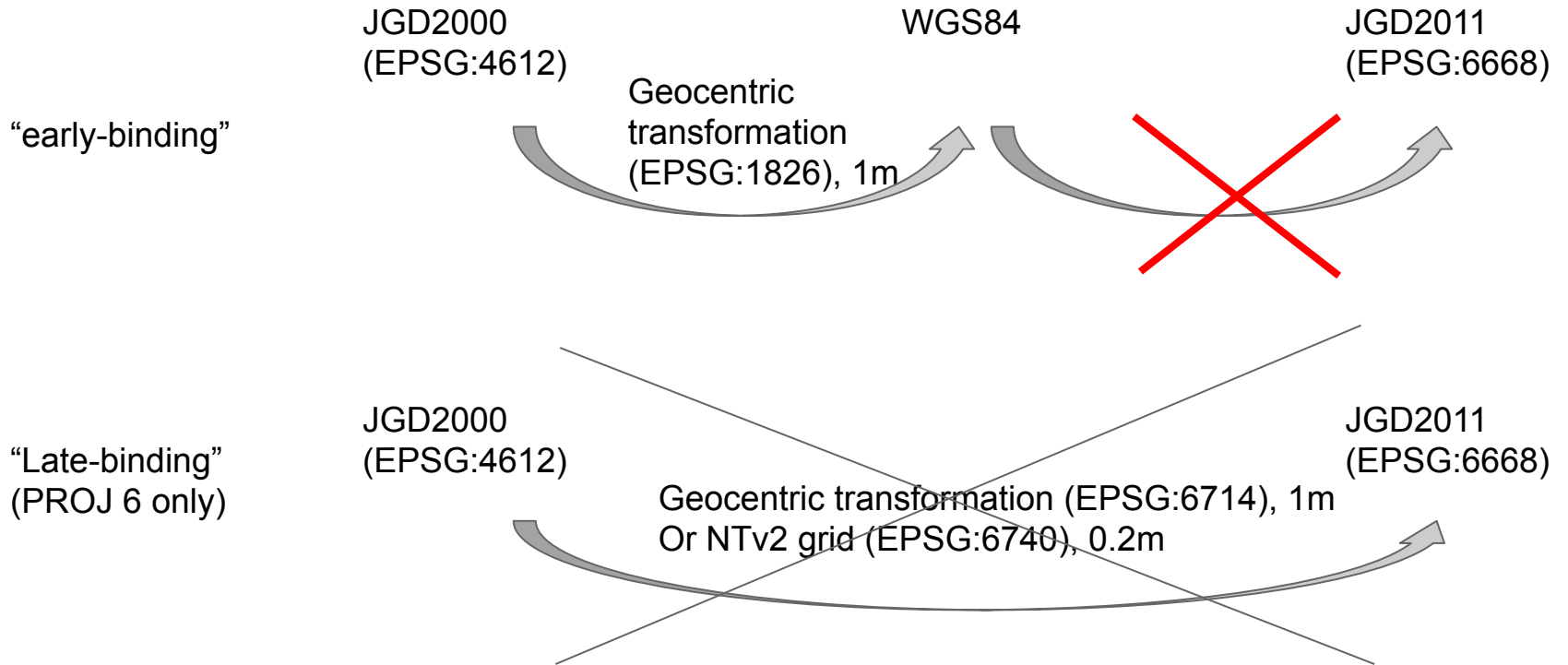
Past situation: coordinate transformation and WGS84 pivot

The ugly
(il brutto)



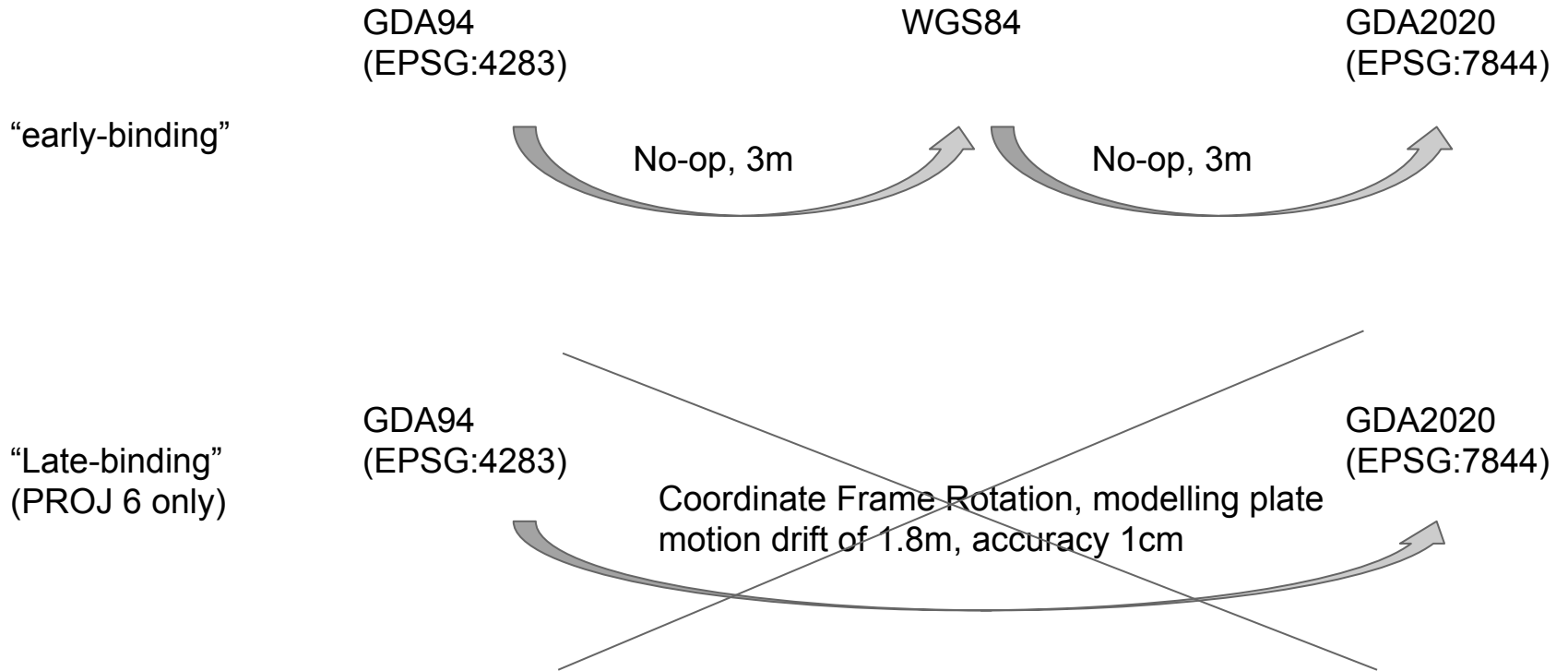
Past situation: coordinate transformation and WGS84 pivot

The bad



Past situation: coordinate transformation and WGS84 pivot

Another bad





gdalbarn.com

PROJ 6 work

- Manages directly WKT (previously in GDAL)
 - ESRI WKT
 - WKT1 (GDAL variant)
 - WKT2:2015 (OGC 12-063r5)
 - WKT2:2019 (OGC 18-010)
- C++ class hierarchy implementing OGC Abstract Topic 2 (Referencing by coordinates) / ISO-19111:2019
- # of LOC doubled !

PROJ 6 work

- SQLite database to store SRS definition
 - No longer CSV files duplicated among software
 - Better query capabilities
 - Multi-catalog: EPSG, ESRI, IGNF
- “Late-binding” CRS transformations
- Use of area of uses
- Temporal component handling

PROJ 6 work

- New command line utility: projinfo
 - Query for CRS or coordinate operation
 - Guess EPSG codes from PROJ or WKT
- Output as PROJ or WKT strings

- Examples:

- projinfo EPSG:4326
- projinfo -s GDA94 -t GDA2020 --summary

Candidate operations found: 5

EPSG:8048, GDA94 to GDA2020 (1), 0.01 m, Australia - GDA

EPSG:8447, GDA94 to GDA2020 (2), 0.05 m, Australia - onshore, at least one grid missing

EPSG:8446, GDA94 to GDA2020 (3), 0.05 m, Australia - onshore, at least one grid missing

EPSG:8445, GDA94 to GDA2020 (5), 0.05 m, Cocos (Keeling) Islands - onshore, at least one grid missing

EPSG:8444, GDA94 to GDA2020 (4), 0.05 m, Christmas Island - onshore, at least one grid missing

Attendance participation needed...

Question: what is the CRS designated by this PROJ string ?

```
+proj=longlat +ellps=GRS80  
+towgs84=0,0,0,0,0,0,0 +no_defs
```

Do **NOT** use PROJ strings for CRS !

Answer:

- ETRS89, (Europe)
 - GDA94, (Australia)
 - GDA2020, (Australia)
 - JGD2000, (Japan)
 - NZGD2000, (New Zealand)
 - NAD83(2011), (North America),
 - SIRGAS 2000, (Latin America)
 - And many others !
- ⇒ Use EPSG codes or WKT

GDAL 3 work

- PROJ 6 is a required dependency
- All WKT support has been moved to PROJ.
Support for WKT2:2015 and :2019
- No longer any CSV file related to CRS →
use PROJ database
- Time-dependent coordinate operations
possible.
- -ct {proj_pipeline} switch to ogr2ogr,
gdalwarp, gdaltransform
- EPSG axis order compliant by default !

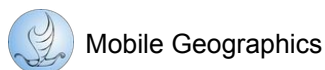
libgeotiff 1.5 work

- PROJ 6 is a required dependency
- No longer any CSV file related to CRS → use PROJ database

Adoption

- PROJ 6.1, GDAL 3.0.1 and libgeotiff 1.5.1 are out
- PROJ 6 adoption:
 - pyproj 2.0
 - rasterio 1.0.25
 - QGIS 3.8 can use PROJ 6 capabilities (require manual building for now)
 - GRASS 7.8
 - PostGIS 3.0dev
 - PDAL 2
 - MapServer 8
 - Full list at <https://github.com/OSGeo/PROJ/wiki/proj.h-adoption-status>

Thanks to the sponsors of GDAL barn !



Questions?

Links:

<https://gdal.org/>

<https://proj.org/>

https://gdal.org/development/rfc/rfc73_proj6_wkt2_srsbarn.html

<https://proj.org/community/rfc/rfc-2.html>

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