NAME

cs2cs − Cartographic coordinate system filter

SYNOPSIS

cs2cs [**−eEfIlrstvwW** [args]]
[[−−area <name_or_code>] | [−−bbox <west_long,south_lat,east_long,north_lat>]]
[−−authority <name>] [−−no−ballpark] [−−accuracy <accuracy>]
([+*opt[=arg]* ...] [+to +*opt[=arg]* ...] | {source_crs} {target_crs})
file ...

where {source_crs} or {target_crs} is one of the possibilities accepted by **proj_create()**, provided it expresses a CRS

- a proj−string,
- a WKT string,
- an object code (like "EPSG:4326", "urn:ogc:def:crs:EPSG::4326", "urn:ogc:def:coordinateOperation:EPSG::1671"),
- an Object name. e.g "WGS 84", "WGS 84 / UTM zone 31N". In that case as uniqueness is not guaranteed, heuristics are applied to determine the appropriate best match.
- a OGC URN combining references for compound coordinate reference systems (e.g "-*urn:ogc:def:crs,crs:EPSG::2393,crs:EPSG::5717*" or custom abbreviated syntax "EPSG:2393+5717"),
- a OGC URN combining references for references for projected or derived CRSs e.g. for Projected 3D CRS "UTM zone 31N / WGS 84 (3D)": "-*urn:ogc:def:crs,crs:EPSG::4979,cs:PROJ::ENh,coordinateOperation:EPSG::16031*" (*added in 6.2*)
- a OGC URN combining references for concatenated operations (e.g. "-*urn:ogc:def:coordinateOperation,coordinateOperation:EPSG::3895,coordinateOperation:EPSG::1618*")
- a PROJJSON string. The jsonschema is at *https://proj.org/schemas/v0.4/projjson.schema.json* (*added in 6.2*)
- a compound CRS made from two object names separated with " + ". e.g. "WGS 84 + EGM96 height" (*added in 7.1*)

New in version 6.0.0.

NOTE:
before 7.0.1, it was needed to add +to between {source_crs} and {target_crs} when adding a filename

DESCRIPTION

cs2cs performs transformation between the source and destination cartographic coordinate reference system on a set of input points. The coordinate reference system transformation can include translation between projected and geographic coordinates as well as the application of datum shifts.

The following control parameters can appear in any order:

−I Method to specify inverse translation, convert from *+to* coordinate system to the primary coordinate system defined.

−t<a> Where *a* specifies a character employed as the first character to denote a control line to be passed through without processing. This option applicable to ASCII input only. (# is the default value).

−d <n> New in version 5.2.0.

Specify the number of decimals in the output.

−e <string>
Where *string* is an arbitrary string to be output if an error is detected during data transformations. The default value is a three character string: ***\t***.

−E Causes the input coordinates to be copied to the output line prior to printing the converted values.

−l<[=id]>
List projection identifiers that can be selected with *+proj*. **cs2cs −l=id** gives expanded description of projection *id*, e.g. **cs2cs −l=merc**.

−lp List of all projection id that can be used with the *+proj* parameter. Equivalent to **cs2cs −l**.

−lP Expanded description of all projections that can be used with the *+proj* parameter.

−le List of all ellipsoids that can be selected with the *+ellps* parameters.

−lu List of all distance units that can be selected with the *+units* parameter.

−r This options reverses the order of the first two expected inputs from that specified by the CRS to the opposite order. The third coordinate, typically height, remains third.

−s This options reverses the order of the first two expected outputs from that specified by the CRS to the opposite order. The third coordinate, typically height, remains third.

−f <format>
Where *format* is a printf format string to control the form of the output values. For inverse projections, the output will be in degrees when this option is employed. If a format is specified for inverse projection the output data will be in decimal degrees. The default format is **"%.2f"** for forward projection and DMS for inverse.

−w<n> Where *n* is the number of significant fractional digits to employ for seconds output (when the option is not specified, **−w3** is assumed).

−W<n>
Where *n* is the number of significant fractional digits to employ for seconds output. When **−W** is employed the fields will be constant width with leading zeroes.

−v Causes a listing of cartographic control parameters tested for and used by the program to be printed prior to input data.

−−area <name_or_code>
New in version 8.0.0.

Specify an area of interest to restrict the results when researching coordinate operations between 2 CRS. The area of interest can be specified either as a name (e.g "Denmark − onshore") or a AUTHORITY:CODE (EPSG:3237)

This option is mutually exclusive with *−−bbox*.

−−bbox <west_long,south_lat,east_long,north_lat>
New in version 8.0.0.

Specify an area of interest to restrict the results when researching coordinate operations between 2 CRS. The area of interest is specified as a bounding box with geographic coordinates, expressed in degrees in a unspecified geographic CRS. *west_long* and *east_long* should be in the [−180,180] range, and *south_lat* and *north_lat* in the [−90,90]. *west_long* is generally lower than *east_long*,

except in the case where the area of interest crosses the antimeridian.

−−no−ballpark
New in version 8.0.0.

Disallow any coordinate operation that is, or contains, a Ballpark transformation

−−accuracy <accuracy>
New in version 8.0.0.

Sets the minimum desired accuracy for candidate coordinate operations.

−−authority <name>
New in version 8.0.0.

This option can be used to restrict the authority of coordinate operations looked up in the database. When not specified, coordinate operations from any authority will be searched, with the restrictions set in the **authority_to_authority_preference** database table related to the authority of the source/target CRS themselves. If authority is set to**any**, then coordinate operations from an y authority will be searched If authority is a non−empty string different of **any**, then coordinate operations will be searched only in that authority namespace (e.g **EPSG**).

This option is mutually exclusive with *−−bbox*.

The *+opt* run−line arguments are associated with cartographic parameters.

The **cs2cs** program requires two coordinate reference system (CRS) definitions. The first (or primary is defined based on all projection parameters not appearing after the *+to* argument. All projection parameters appearing after the *+to* argument are considered the definition of the second CRS. If there is no second CRS defined, a geographic CRS based on the datum and ellipsoid of the source CRS is assumed. Note that the source and destination CRS can both of same or different nature (geographic, projected, compound CRS), or one of each and may have the same or different datums.

When using a WKT definition or a AUTHORITY:CODE, the axis order of the CRS will be enforced. So for example if using EPSG:4326, the first value expected (or returned) will be a latitude.

Internally, **cs2cs** uses the **proj_create_crs_to_crs()** function to compute the appropriate coordinate operation, so implementation details of this function directly impact the results returned by the program.

The environment parameter **PROJ_LIB** establishes the directory for resource files (database, datum shift grids, etc.)

One or more files (processed in left to right order) specify the source of data to be transformed. A **−** will specify the location of processing standard input. If no files are specified, the input is assumed to be from stdin. For input data the two data values must be in the first two white space separated fields and when both input and output are ASCII all trailing portions of the input line are appended to the output line.

Input geographic data (longitude and latitude) must be in DMS or decimal degrees format and input cartesian data must be in units consistent with the ellipsoid major axis or sphere radius units. Output geographic coordinates will normally be in DMS format (use **−f %.12f** for decimal degrees with 12 decimal places), while projected (cartesian) coordinates will be in linear (meter, feet) units.

Use of remote grids

New in version 7.0.0.

If the **PROJ_NETWORK** environment variable is set to **ON**, **cs2cs** will attempt to use remote grids stored on CDN (Content Delivery Network) storage, when they are not available locally.

More details are available in the network section.

EXAMPLES

Using PROJ strings

The following script

```
cs2cs +proj=latlong +datum=NAD83 +to +proj=utm +zone=10 +datum=NAD27 -r <<EOF
45°15'33.1" 111.5W
45d15.551666667N -111d30
+45.25919444444 111d30'000w
EOF
```

will transform the input NAD83 geographic coordinates into NAD27 coordinates in the UTM projection with zone 10 selected. The geographic values of this example are equivalent and meant as examples of various forms of DMS input. The x-y output data will appear as three lines of:

```
1402293.44  5076292.68 0.00
```

Using EPSG CRS codes

Transforming from WGS 84 latitude/longitude (in that order) to UTM Zone 31N/WGS 84

```
cs2cs EPSG:4326 EPSG:32631 <<EOF
45N 2E
EOF
```

outputs

```
421184.70   4983436.77 0.00
```

Using EPSG CRS names

Transforming from WGS 84 latitude/longitude (in that order) with EGM96 height to UTM Zone 31N/WGS 84 with WGS84 ellipsoidal height

```
echo 45 2 0 | cs2cs "WGS 84 + EGM96 height" "WGS 84 / UTM zone 31N"
```

outputs

```
421184.70   4983436.77 50.69
```

SEE ALSO

proj(1), **cct(1)**, **geod(1)**, **gie(1)**, **projinfo(1)**, **projsync(1)**

BUGS

A list of known bugs can be found at *https://github.com/OSGeo/PROJ/issues* where new bug reports can be submitted to.

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https://proj.org/

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