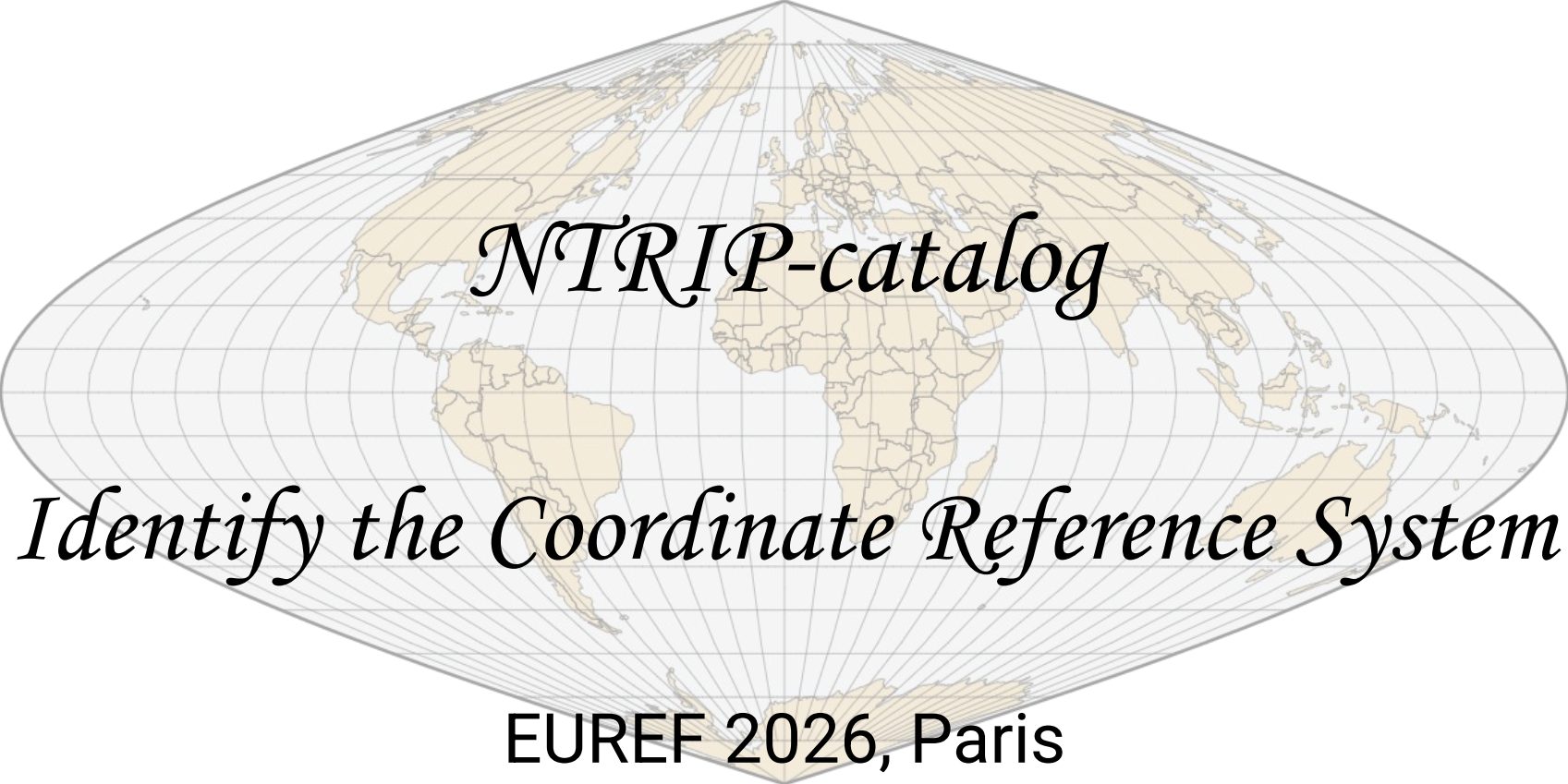




NTRIP-catalog

Identify the Coordinate Reference System

EUREF 2026, Paris

NTRIP-catalog. Identify the Coordinate Reference System

Javier Jimenez Shaw

PROJ contributor. P R  J

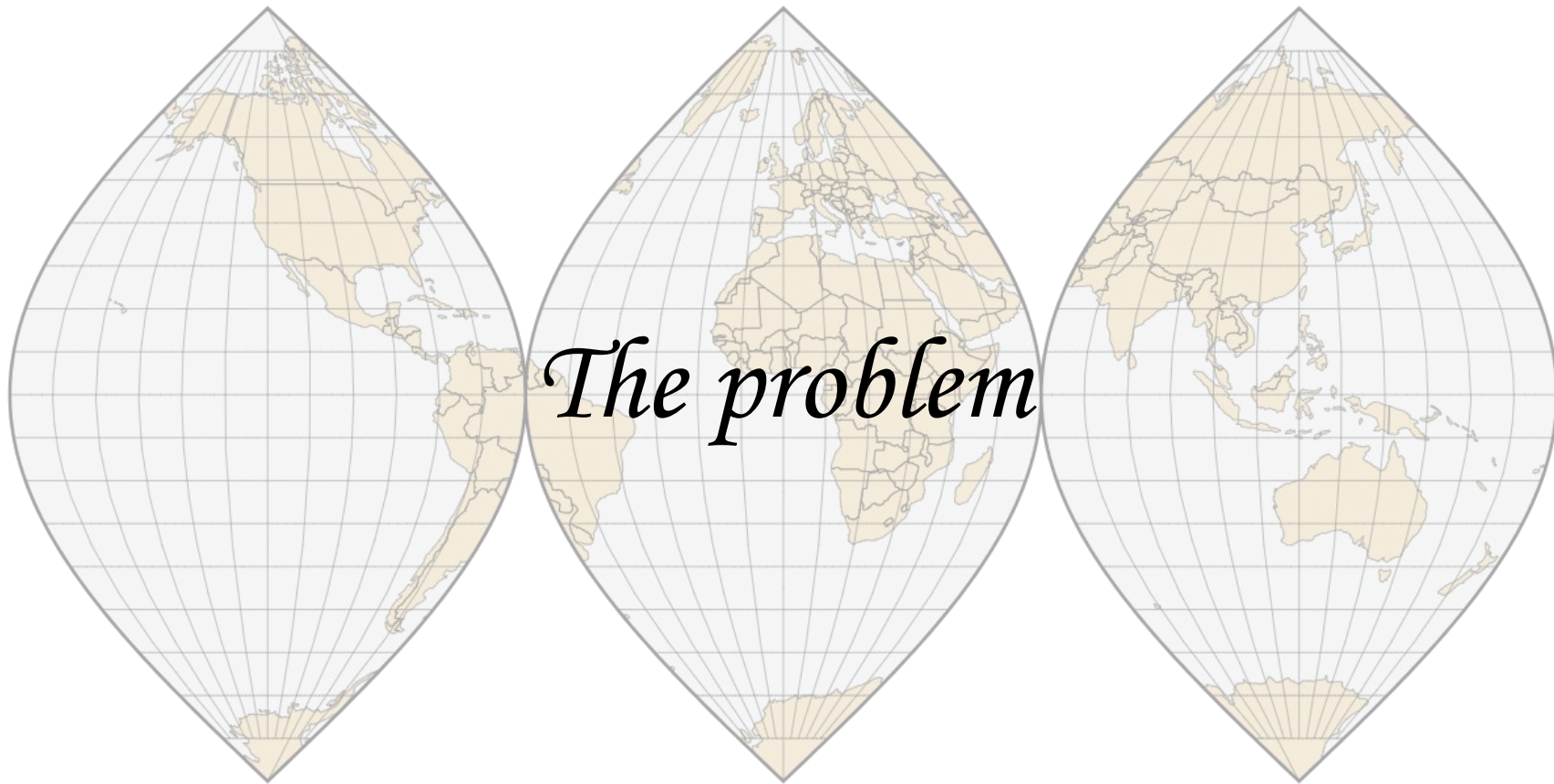
Technical Coordinator of Spatial Reference System
team at **Pix4D**.



<https://github.com/jjimenezshaw/>

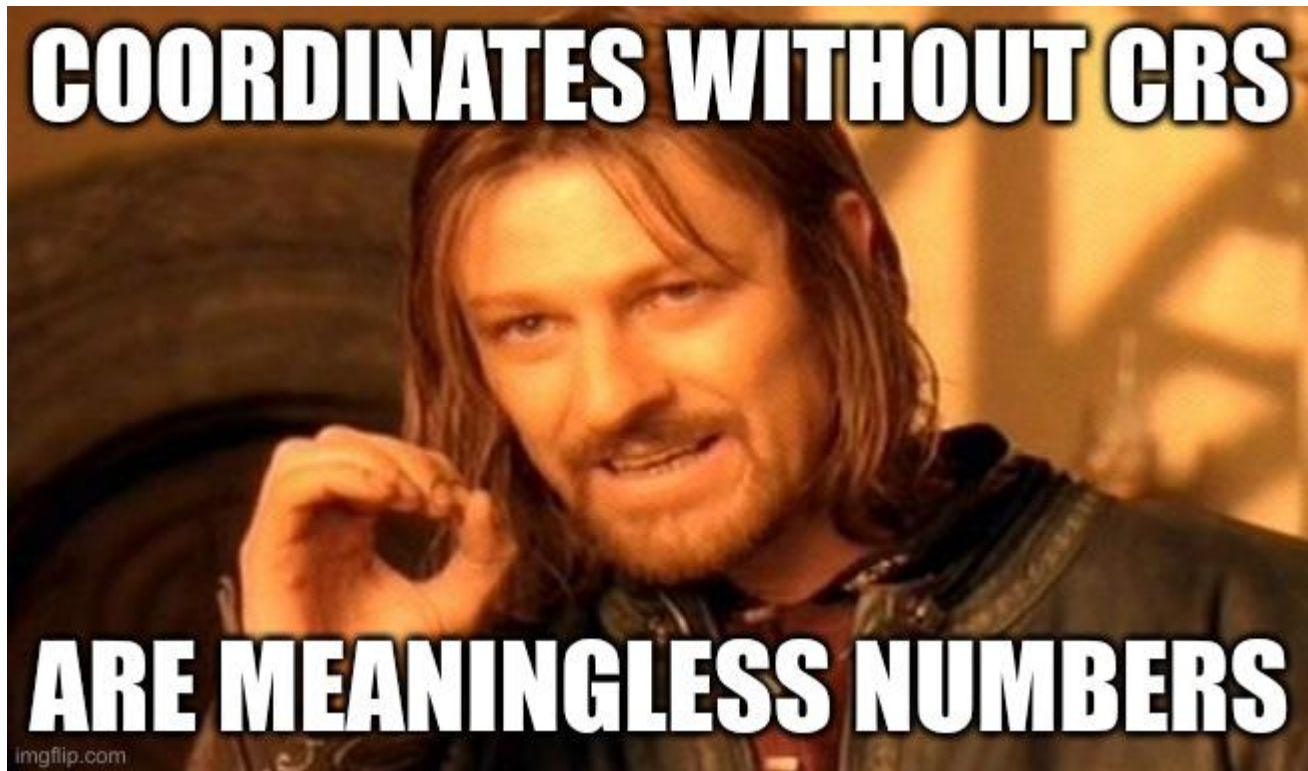
Summary

- The problem 🤯
 - There is no CRS information in RTK / NTRIP.
 - Therefore there is no easy way to tag the coordinates.
- What are we doing here? 🤔
 - Software between the user and the NTRIP provider
- The solution 🎉
 - Make a catalog with CRS information for the NTRIP services (public and private).
 - CRS info is not changing that often.
 - Open Source!



NTRIP / RTK corrections

In which Coordinate Reference System ?



It is not WGS 84 !!!

However, many user still say WGS 84 for lat-lon coordinates.

“WGS 84: I don’t know, I don’t care”

<https://youtu.be/M2ck3cAGvhg>



No information available

There is **no CRS information** in **NTRIP 2.0**

There is **no CRS information** in **RTCM 3.3**

There is **something in RTCM 3.4** (optional)

New features – RTCM support

- support new RTCM 3.4 transformation messages
 - 1300 – Service-CRS: Coordinate Reference System of the RTCM base service
 - 1301 – 15-Parameter Helmert Transformation, Time-Dependent Linear Expression
 - 1302 – RTCM-CRS: additional details for a CRS with standardised link for automated procedure, e.g. EPSG and ISO
 - Outlook: NMEA will use the same approach

No message RTCM 1300 found in ...

blinknet.**no**

demo.geodnet.com

ergnss-tr.ign.**es**

flepos.vlaanderen.**be**

ntrip.ales-corp.co.**jp**

ntrip.data.gnss.ga.gov.**au**

ntrip.rtkconnect.**dk**

ntrip.satinfo.**fr**

ntrip.terasat.co.**jp**

ntrip2.gnssnet.**hu**

nrtk-swepos.lm.**se**

rtkamericas.topnetlive.com

rtk.geodnet.com

rtk.topnetlive.com

rtn.dot.**ny**.gov

vrs.kddi.ne.**jp**

www.sapos-bb-ntrip.**de**

www.sapos-be-ntrip.**de**

www.sapos-bw-ntrip.**de**

www.swipos.**ch**

It is not obvious

- ITRFxx vs static datums (ETRS89)
- Different realizations (ETRFxx)
- New CRS adoption (like in the USA soon)
- Countries in different datums (like Spain or France)
- Old official CRS, that is not what RTCM uses (like Switzerland, The Netherlands, UK, etc)



You can pick **at most two**

- ❑ I don't want to understand [work with] dynamic datums (time dependent coordinates).
- ❑ I want a single geographic CRS worldwide.
- ❑ I want centimeter accuracy.

Enjoy your choice!

<https://mapstodon.space/@jjimenezshaw/116080417657531106>



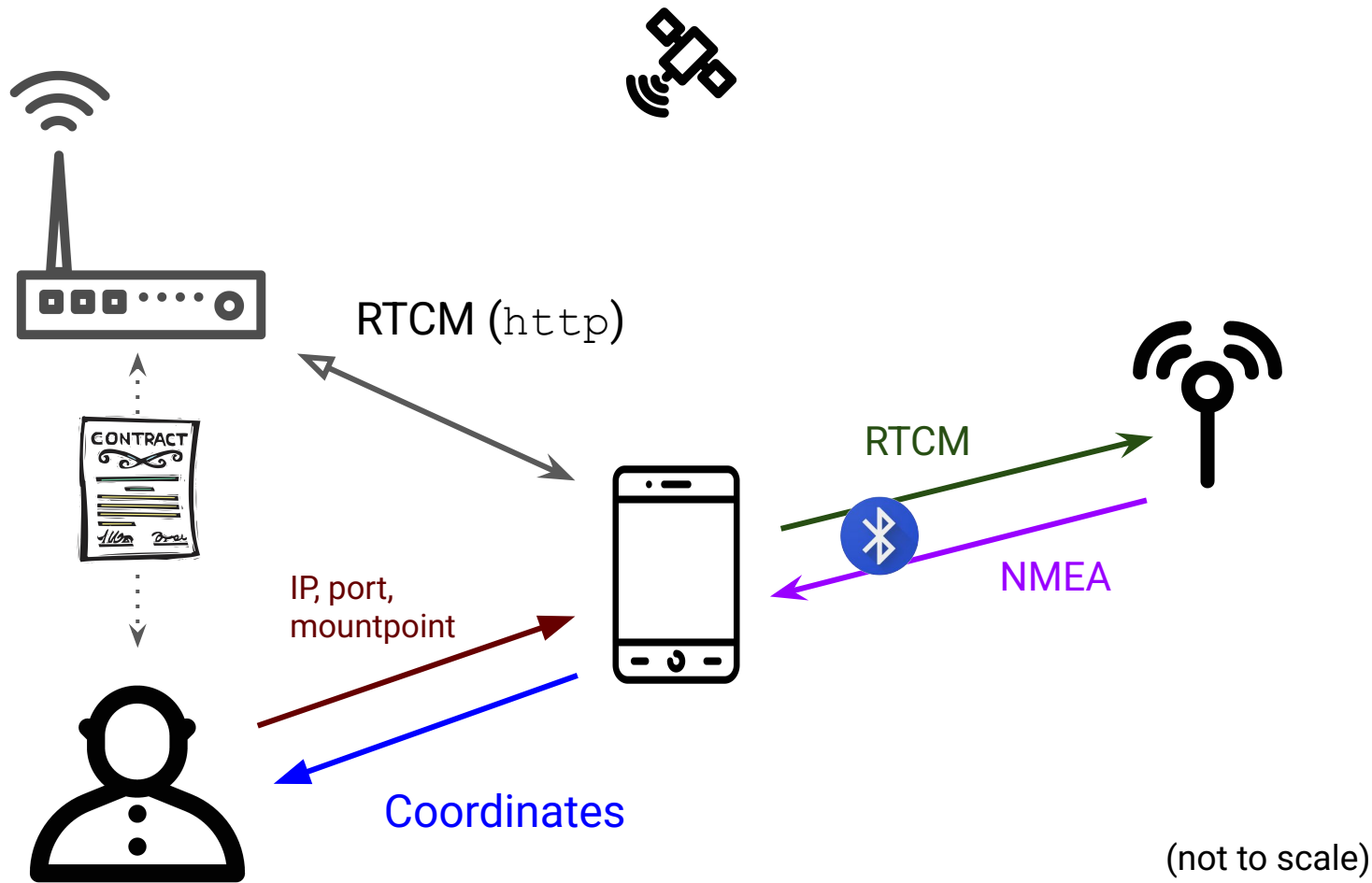
RTK is affordable



NTRIP is an easy solution

NTRIP

Networked Transport of RTCM via Internet Protocol



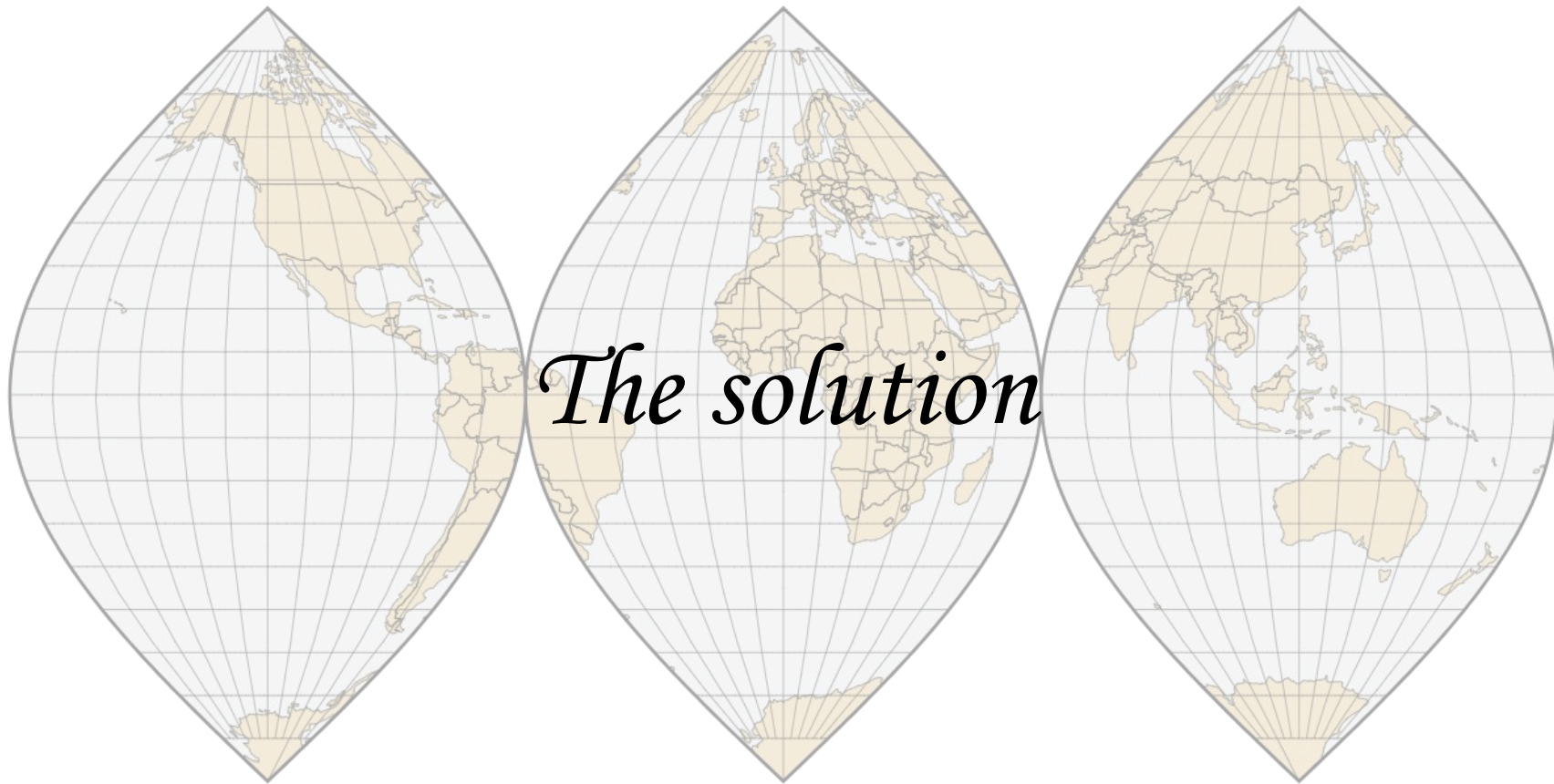
Software in the device

- In any country
- With “any” RTK device
- With any NTRIP provider
- With “any user”



Software in the device

- Establish the “http” connection
 - Knows **IP, port, mountpoint** (and its approximate **location**)
- ...
- Get information from RTK device (NMEA)
- Show coordinates to the user. On which CRS?



<https://ntrip-catalog.org>



NTRIP-catalog

- Information about the CRS of different NTRIP providers.
- Open source / open data (CC0 license).
- Simple **JSON** file with all the information.
- Human and computer readable.
- Very easy to add new providers.



Easy



```
{
  "name": "SPSLUX",
  "description": "Satellite Positioning System Luxembourg",
  "urls": [
    "http://stream.spslux.lu:5005"
  ],
  "reference": {
    "url": "https://act.public.lu/fr/gps-reseaux/spslux1/s"
  },
  "last_update": "2025-01-13",
  "streams": [
    {
      "filter": "all",
      "crss": [
        {
          "id": "EPSG:7931",
          "name": "ETRF2000",
          "epoch": 2020.82
        }
      ]
    }
  ]
}
```

Complicated



```
{
  "name": "Point One Nav",
  "description": "Point One Navigation world service",
  "urls": [
    "http://truertk.pointonnav.com:2101",
    "http://virtualrtk.pointonnav.com:2101",
    "http://truertk-us.pointonnav.com:2101",
    "http://truertk-eu.pointonnav.com:2101",
    "http://truertk-apac.pointonnav.com:2101",
    "https://truertk.pointonnav.com:2102",
    "https://virtualrtk.pointonnav.com:2102",
    "https://truertk-us.pointonnav.com:2102",
    "https://truertk-eu.pointonnav.com:2102",
    "https://truertk-apac.pointonnav.com:2102"
  ],
  "reference": {
    "url": "https://support.pointonnav.com/connect-to-polaris-rtk"
  },
  "last_update": "2025-01-29",
  "streams": [
    {
      "filter": {
        "mountpoints": [
          "POLARIS"
        ]
      },
      "crss": [
        {
          "id": "EPSG:7912",
          "name": "ITRF2014",
          "epoch": "now"
        }
      ]
    }
  ]
}
```

```

{
  "filter": {
    "mountpoints": [
      "POLARIS_LOCAL"
    ]
  },
  "crss": [
    {
      "id": "EPSG:6667",
      "name": "JGD2011",
      "rover_countries": [
        "JPN"
      ],
      "description": "Japan"
    },
    {
      "id": "EPSG:4927",
      "name": "KGD2002",
      "rover_countries": [
        "KOR"
      ],
      "description": "South Korea"
    },
    {
      "id": "EPSG:7929",
      "name": "ETRF97",
      "epoch": 2009.756,
      "rover_countries": [
        "GBR"
      ],
      "description": "United Kingdom"
    }
  ],

```

```

{
  "id": "EPSG:8254",
  "name": "NAD83(CSR)v7",
  "rover_countries": [
    "CAN"
  ],
  "description": "Canada"
},
{
  "id": "EPSG:6324",
  "name": "NAD83(MA11)",
  "rover_bbox": [
    129.48,
    1.64,
    149.55,
    23.9
  ],
  "description": "Guam"
},
{
  "id": "EPSG:6321",
  "name": "NAD83(PA11)",
  "rover_bbox": [
    157.47,
    -17.56,
    -151.27,
    31.8
  ],
  "description": "Hawaii"
},
{
  "id": "EPSG:6319",
  "name": "NAD83(2011)",
  "epoch": 2010.0,
  "rover_countries": [
    "USA"
  ],
  "description": "Continental USA, after Guam and Hawaii"
},

```

Why?

- We cannot wait for a common usage of RTCM 1300
 - (that's many years)
- Solves actual indeterminateness
 - like ITRF2014 vs ETRS89/ETRFxx
- Example: In USA next year they will have a new CRS: NATRF2022
(vs NAD83(2011))

Contribute, update and spread the word!

It's open source / open data. 

Win-win for:

- **Providers:** clear tagging of the coordinates. **Happy users.**
- **Users:** no need to configure or know the CRS. **All works.**
- **Developers:** implement once, use always.



Via Issue, Pull-Request, or just send an email.





PROJ

After some issues in EPSG regarding ETRS89 ensemble, PROJ is collecting data from **geodetic agencies to test transformations as they expect.**

Please, contact PROJ.org to provide some samples of your expected transformations.



Thank you!

Javier Jimenez Shaw

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