NTRIP-catalog

Using the proper CRS

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NTRIP-catalog. Using the proper CRS

Javier Jimenez Shaw

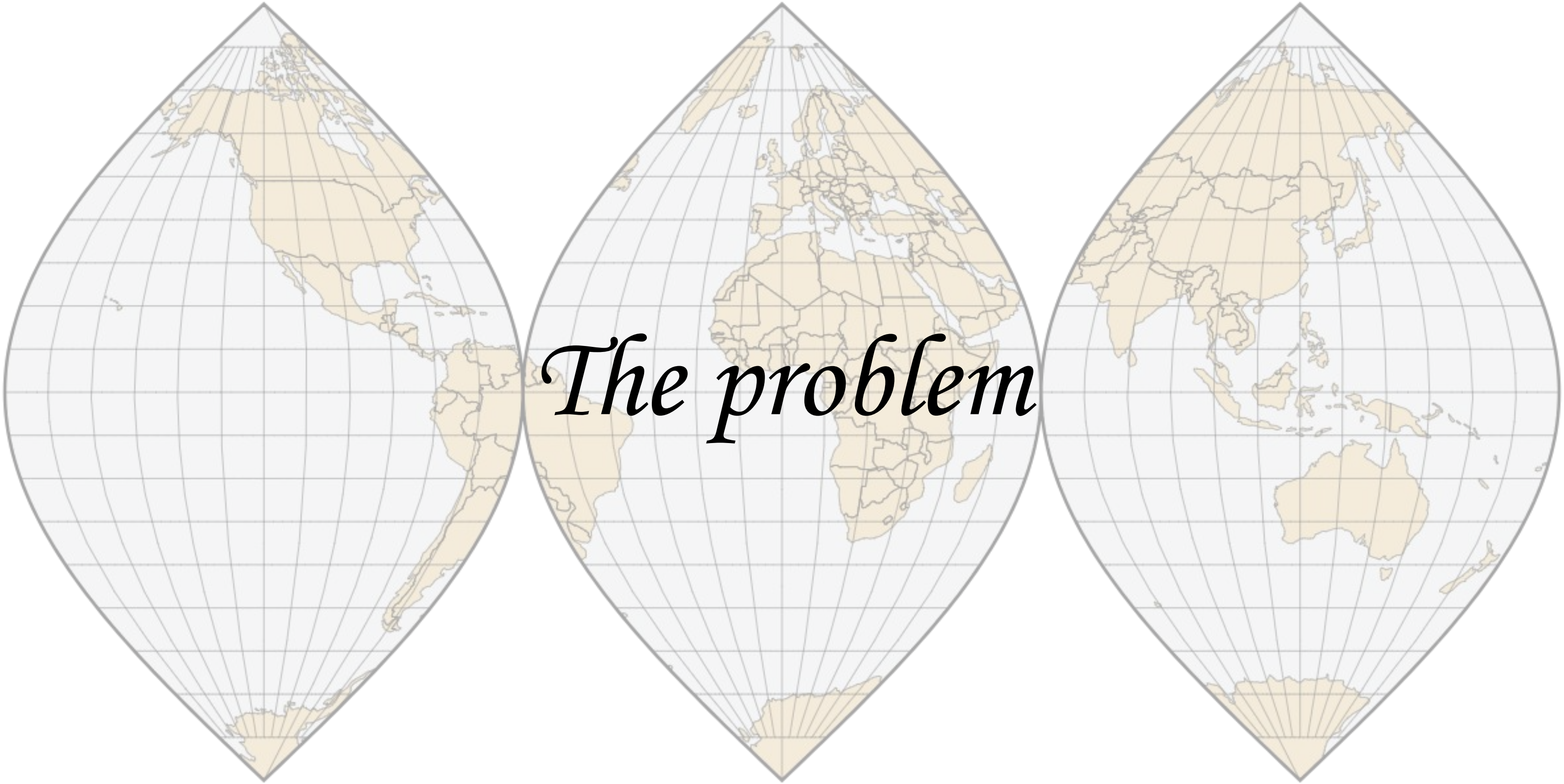
PROJ contributor.

Technical Coordinator of SRS team at Pix4D.

https://github.com/jjimenezshaw/

Summary

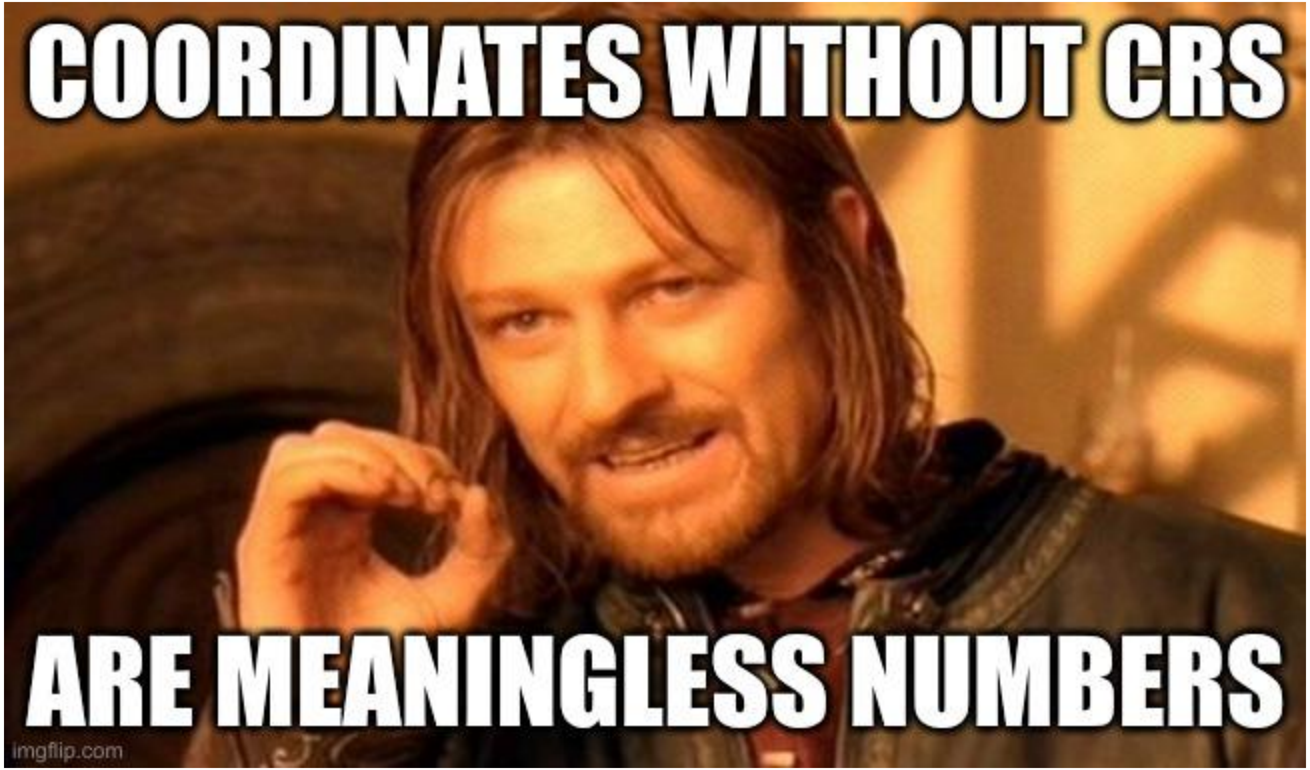
- The problem 😱
  - There is no CRS in formation in RTK / NTRIP.
  - Therefore there is no easy way to tag the coordinates.
- What are we doing here? 🤔
  - Software between the user and the NTRIP provider
- The solution 🥳
  - Make a catalog with CRS information for the NTRIP services (public and private).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



The problem

NTRIP / RTK corrections

In which Coordinate Reference System ?


COORDINATES WITHOUT CRS
ARE MEANINGLESS NUMBERS
imgflip.com

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 …

demo.geodnet.com
ergnss-tr.ign.es
ntrip.ales-corp.co.jp
ntrip.data.gnss.ga.gov.au
ntrip.terasat.co.jp
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 next year)
- Countries in different datums (like Spain or France)
- Old official CRS, that is not what RTCM uses (like Switzerland, The Netherlands, UK, etc)

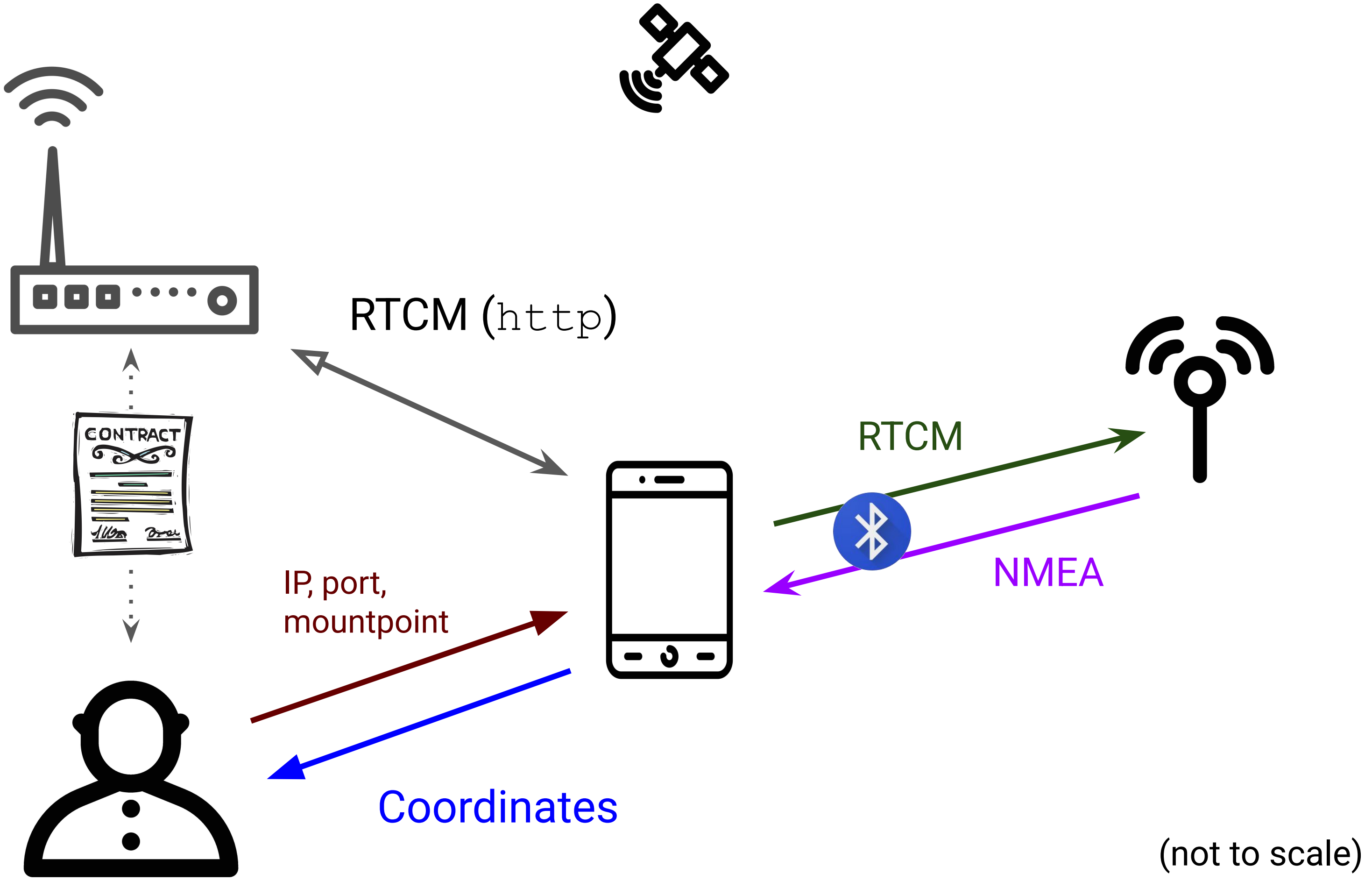
What are we doing here?

RTK is a affordable

NTRIP is an easy solution

NTRIP

Networked Transport of RTCM via Internet Protocol

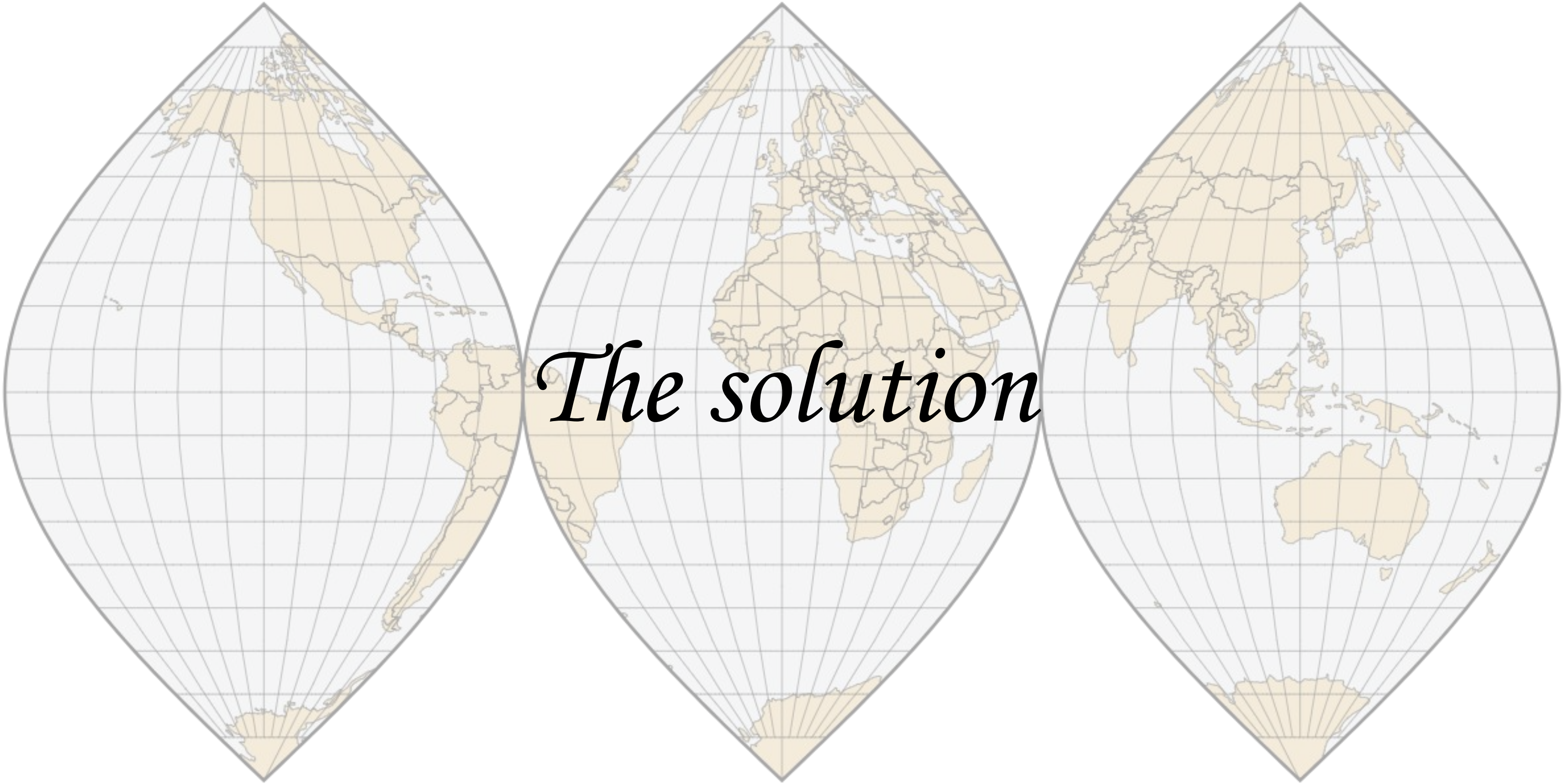

RTCM (http)
CONTRACT
RTCM
NMEA
IP, port,
mountpoint
Coordinates
(not to scale)

Software in the device

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

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?



The solution

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": "FPRN",
    "description": "Florida Primary Reference Network",
    "urls": [
        "http://40.121.5.206:10000",
        "http://ntrip.myfloridagps.com:10000"
    ],
    "reference": {
        "url": "https://www.fdot.gov/Geospatial/fprnfaq.shtm"
    },
    "last_update": "2024-12-09",
    "streams": [
        {
            "filter": "all",
            "crss": [
                {
                    "id": "EPSG:6319",
                    "name": "NAD83(2011)"
                }
            ]
        }
    ]
},
```

Complicated


```
{
    "name": "Point One Nav",
    "description": "Point One Navigation world service",
    "urls": [
        "http://truertk.pointonenav.com:2101",
        "http://virtualrtk.pointonenav.com:2101",
        "http://truertk-us.pointonenav.com:2101",
        "http://truertk-eu.pointonenav.com:2101",
        "http://truertk-apac.pointonenav.com:2101",
        "https://truertk.pointonenav.com:2102",
        "https://virtualrtk.pointonenav.com:2102",
        "https://truertk-us.pointonenav.com:2102",
        "https://truertk-eu.pointonenav.com:2102",
        "https://truertk-apac.pointonenav.com:2102"
    ],
    "reference": {
        "url": "https://support.pointonenav.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(CSRS)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.

Thank you!

Javier Jimenez Shaw

javier.shaw@pix4d.com

???

Do you know what geoid model are using the RTK receivers?

NMEA has

- Latitude
- Longitude
- **Orthometric height**
- **Geoid undulation**