Network Earth Rotation Service

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Goals:

- to provide accurate short-term (up to 48 hours) EOP prediction
- to provide a convenient interface to the Earth rotation matrix at any time since 1976.0 through 48 hours in the future
- to off-load the user from downloading the EOP, interpolating them, and computing the Earth rotation matrix.

AAM computation:

- Input data: NASA GEOS-FPIT (assimilation) and GEOS-FP (forecast). Latencies: 6–16 hours. Forecast: up to 72 hours. Resolution: $0.25° \times 0.3125° \times 72 \times 3^h$. New input data are checked once an hour
- Upgridding to $2' \times 2'$, interpolation/extrapolation to [-1,90] km.
- Computation of air density
- Expansion into 3D B-spline basis
- Computation of AAM in limits from the surface defined by Gtopo30 digital elevation model to 90km
- IB and non-IB terms are computed
- Available at **http://aam.earthrotation.net**

EOP series ingestion:

New data are checked once an hour.

- UT1 from IAA Intensive-R observations
- UT1 from IVS Intensive-I observations
- polar motion from IGS ultra-rapid
- UT1 and polar motion from IVS observations
- C04 IERS time series
- nutation expansion from Astrogeo Center quarterly VLBI solutions.

Short-term EOP prediction:

Time series of UT1 and polar motion are expanded into B-spline basis with time step 36 hours. The coefficients of the expansion are found in the data assimilation scheme that includes 1) IERS C04 for the data they are available; 2) for the last 30 days when IERS C04 is not available: a) EOP time series; b) EOP extrapolation with a low degree polynomial; c) AAM.
The time series are de-biased wrt IERS C04 and re-weighted. Stabilizing constraints on the second derivative are imposed.

How to use:

1 (*very old-fashioned*) Order time series for the specified time range and step using long URL.

http://earthrotation.net/cgi-bin/eop_series.py?start_date=2017.07.01&stop_date=2017.09.01&time_step=3600&eop_group=polu&service=series

2 (*old*) Order the the specified EOP(s) for the specified moment of time using the long URL. Time moment "now" means the current moment.

http://earthrotation.net/cgi-bin/eop_online.py?req_date=now&param=matrix&content=text

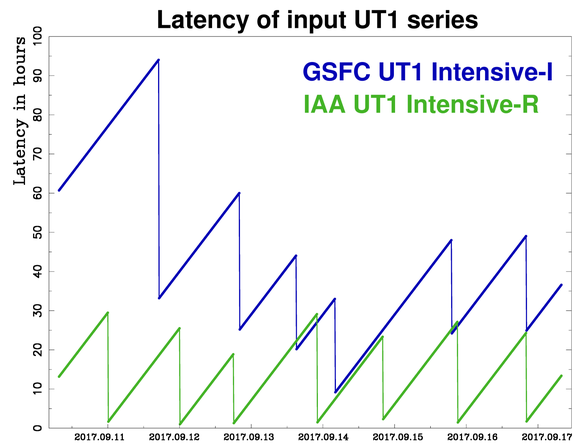
3 (*modern*) Using NERS library.

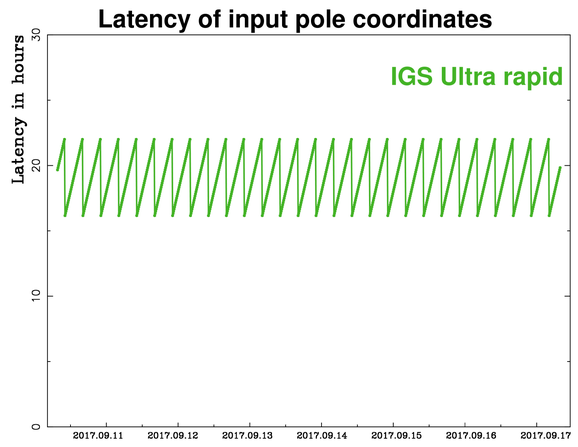
Insert the code like that in your program

```
!  --- Initialize NERS

       CALL NERS_INIT ( CONFIG_FILE, NERS, TIME_TAI_BEG, TIME_TAI_END, IUER )

! ---   Get the 3x3 Earth Rotation Matrix EARTH_ROT_MAT on TIME_TAI_OBS

       CALL NERS_GET_EOP ( NERS, TIME_TAI_OBS, 'mat', 9, LPAR, EARTH_ROT_MAT, IUER )
```

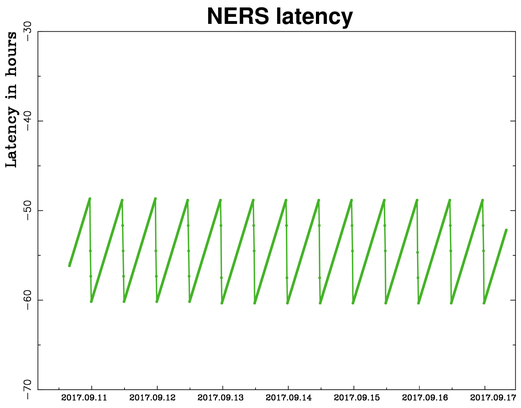
The NERS client library will make the rest: check the local cache, communicate with the NERS server, download the NERS message, compute the rotation matrix for the specified moment of time (TIME_TAI_OBS)

Latencies of the NERS:



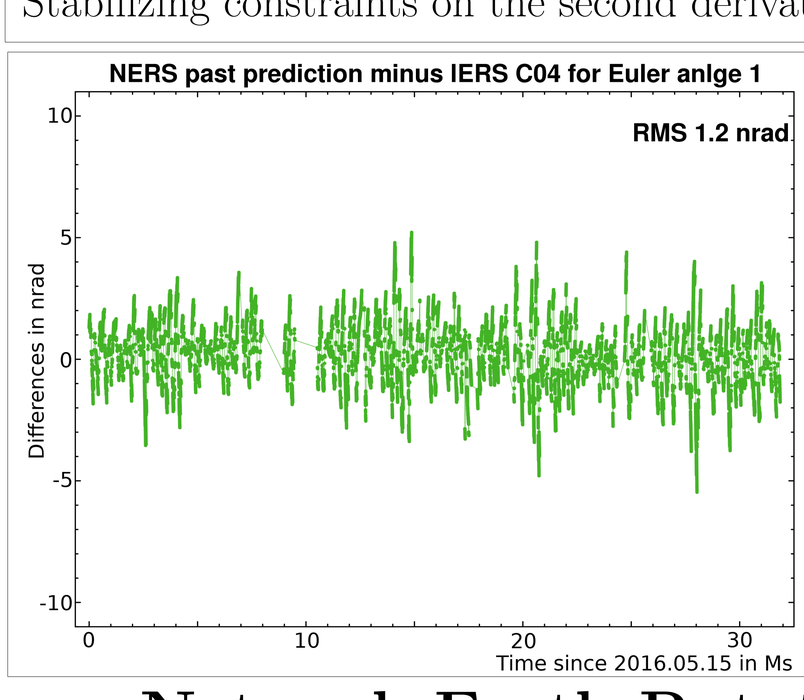


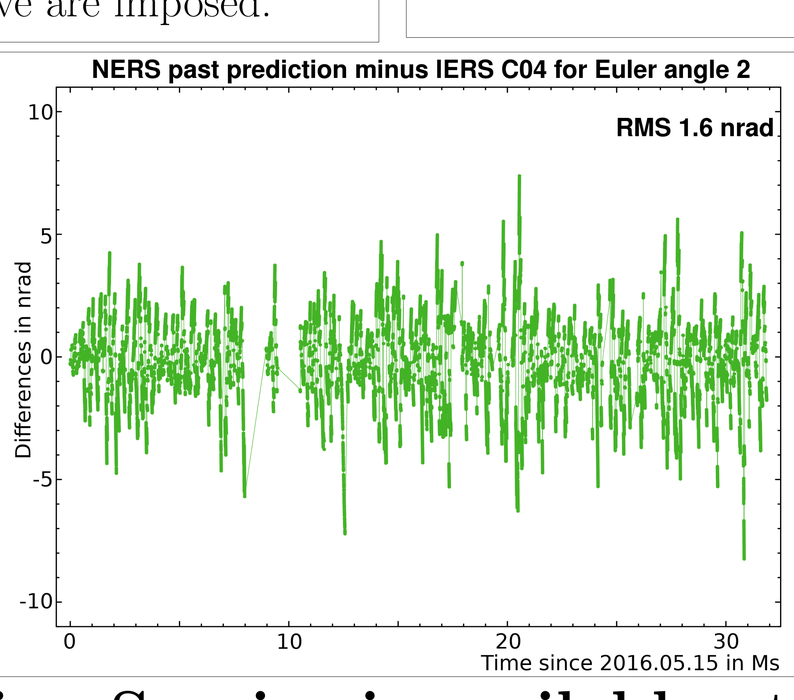
Average UT1 latency: 14^h
Average pole coordinate latency: 18^h
Average AAM latency: -60^h
NERS EOP prediction: 48–60^h wrt now

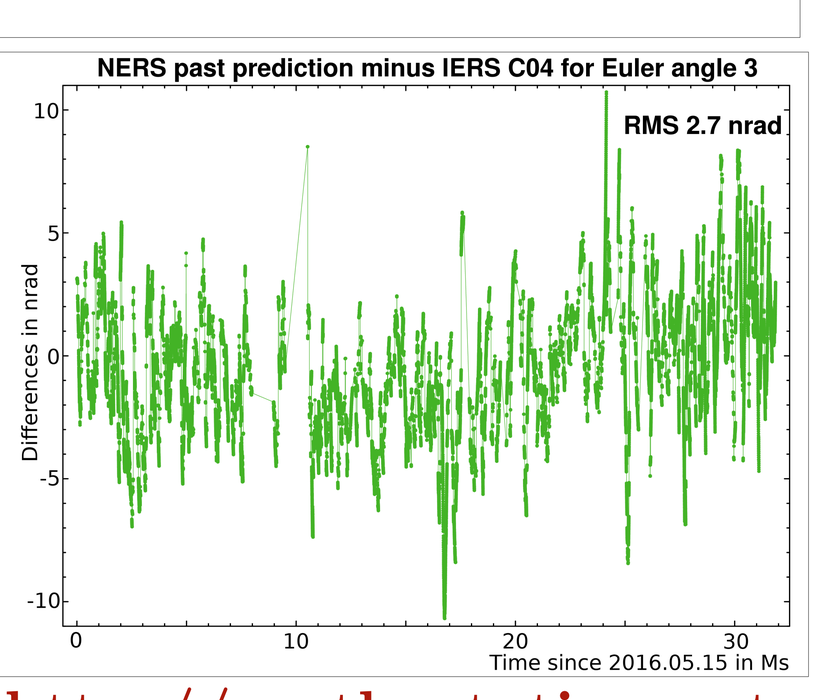


Accuracy of EOP prediction:

RMS of past real-time EOP predictions wrt IERS C04:
1.2, **1.6** and **2.7** nrad (8, 10, 17 mm for 3 EOP components)







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