Technical Note

PP-RTX

Document Description	Revision	Author
What is the PP-RTX service and how to use it in POSPac	REV 0	Christian Feld

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A TRIMBLE COMPANY

1 What is Real-Time EXtended (RTX) & Post-processed RTX (PP-RTX)

In the middle of 2011 Trimble introduced the CenterPoint RTX real-time positioning service providing centimeter accurate positions for global real-time applications. The corrections containing real-time precise orbit, clock and other information are transmitted to the rover via satellite or Internet. The error sources such as satellite orbit, satellite clock, atmospheric delays are modeled at the rover location. The advanced software algorithms running on the rover receiver and satellite motion allow the position to quickly converge to an integer carrier phase solution. All broadcasted corrections are derived from global network of Trimble base stations. Using the precise data derived from the real-time CenterPoint RTX system, a new high-accuracy post-processed RTX-Aided inertial processing method has been developed for POSPac MMS, enabling robust, cm level positioning to be achieved for mobile mapping without reference stations.

2 PP-RTX specifications

	PPP	PP-RTX
Availability	2 weeks after mission	1 h after mission
Horizontal accuracy	10 cm	< 3cm
Vertical accuracy	10 – 30 cm	< 6cm
Mission duration	up to 120 min for full accuracy	Standard RTX : 30 min for full accuracy Fast RTX: 10min

Table 1: Comparison Specifications PPP and PP-RTX

For selected regions in North America and Europe, the Trimble Fast RTX service is available (see Fig. 1) which allowing customers to achieve horizontal positions accuracy of better than 3 cm in less than 5 minutes.
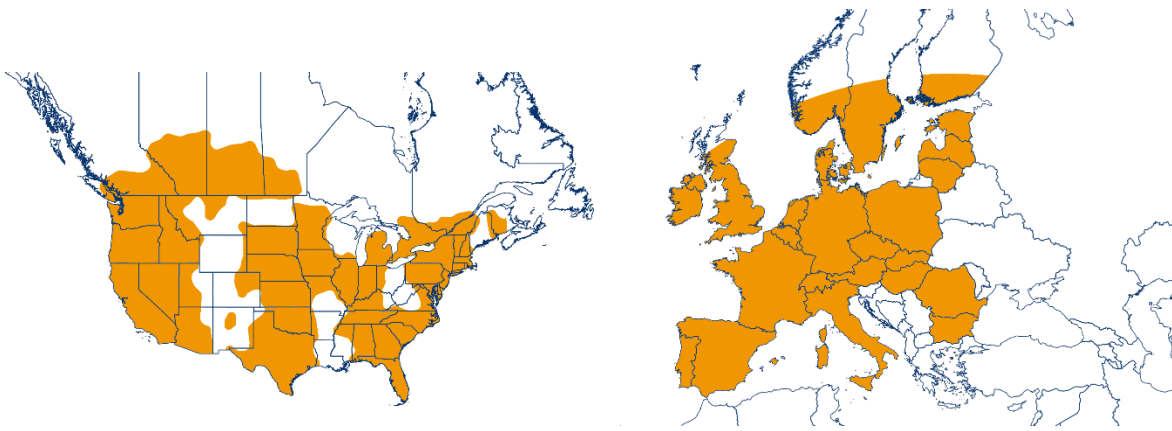
Figure 1: Fast RTX regions

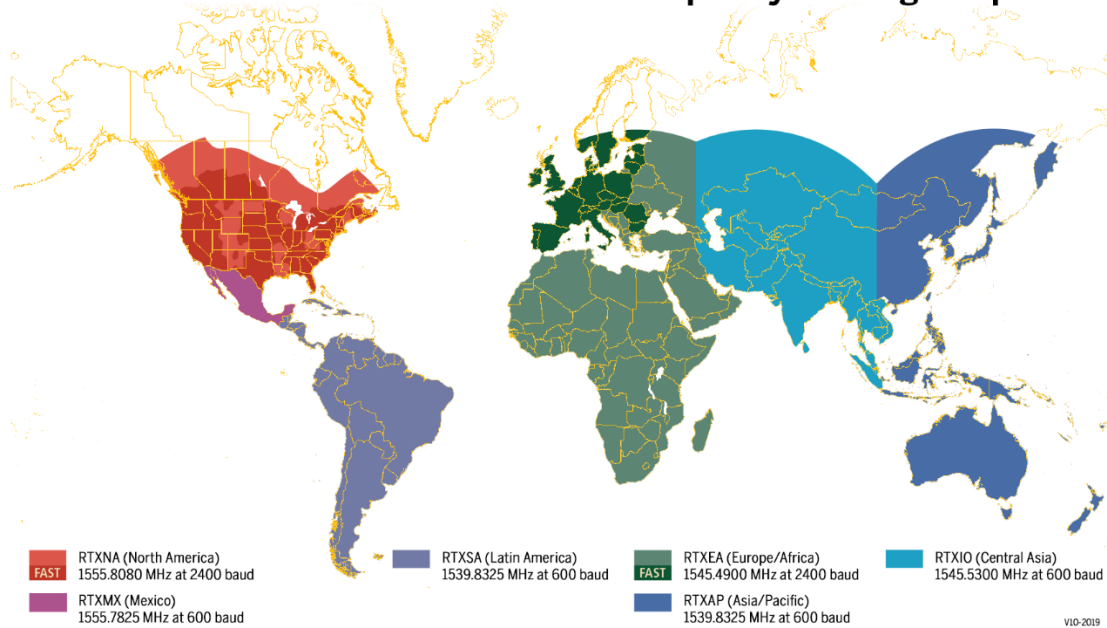## Trimble RTX® Satellite Broadcast Frequency Coverage Map

RTXNA (North America)
FAST 1555.8080 MHz at 2400 baud

RTXMX (Mexico)
1555.7825 MHz at 600 baud

RTXSA (Latin America)
1539.8325 MHz at 600 baud

RTXEA (Europe/Africa)
FAST 1545.4900 MHz at 2400 baud

RTXAP (Asia/Pacific)
1539.8325 MHz at 600 baud

RTXIO (Central Asia)
1545.5300 MHz at 600 baud

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Figure 2: Coverage map of Trimble RTX service

For the regions with Standard RTX which uses the global ionospheric model the convergence time is about 25min for full accuracy. For the Fast RTX regions where a regional ionospheric model is used the convergence time is less than 5 minutes for full accuracy.
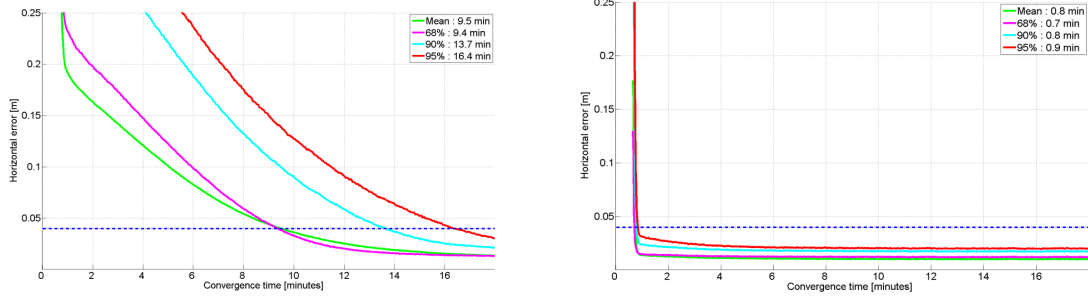
Figure 3: Comparison Convergence time Standard RTX (left) and Fast RTX (right)

3 How to use PP-RTX in POSPac 8

The requirements for using the PP-RTX service in POSPac 8 are listed below:

- POSPac 8 and PP-RTX Subscription (6 months or 12 months)
- Internet connection
- Mission duration at least 40 minute duration for Standard RTX and at least 15 minute duration for Fast RTX
- Clean GNSS observables free from data gaps and with minimal cycle slips
- Calibrated antenna (provided)

The Post-processed RTX (PP-RTX) implementation in POSPac is comprised of three components:

1. A web-based service that provides the CenterPoint RTX information along the rover trajectory to be post-processed.
2. A QC step that processes the information from the service with the raw rover observables in forward and reverse time to generate the convergence-free PPRTX GNSS solution
3. Generation of the final RTX-Aided Inertial navigation solution using a Kalman filter and optimal smoother processing
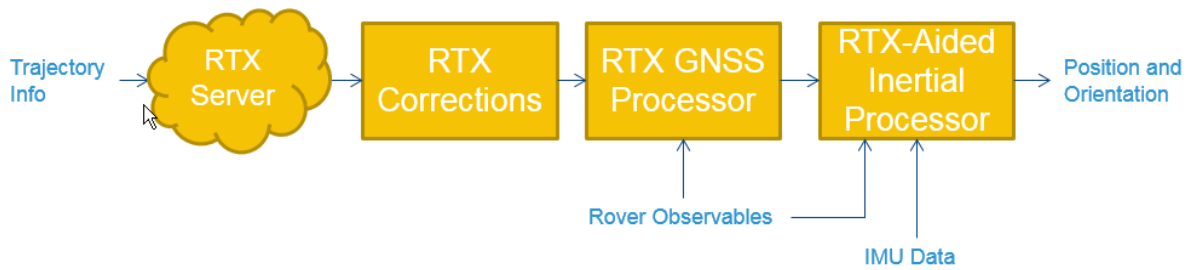
Figure 4: PP-RTX implementation in POSPac

The post-processed CenterPoint RTX service is accessed automatically from the POSPac MMS via an internet connection. A compressed trajectory derived from the real-time solution is uploaded to the RTX server infrastructure and used to retrieve a set of data comprised of orbit, clock and additional local bias information derived from the real-time CenterPoint RTX service. Unlike a traditional PPP solution that uses IGS or equivalent ephemeris data that can take several days to compute, this information is available within 1 hour after the mission.

To use PP-RTX in POSPac 8.X the following steps has to be performed:

- Import rover data as usual
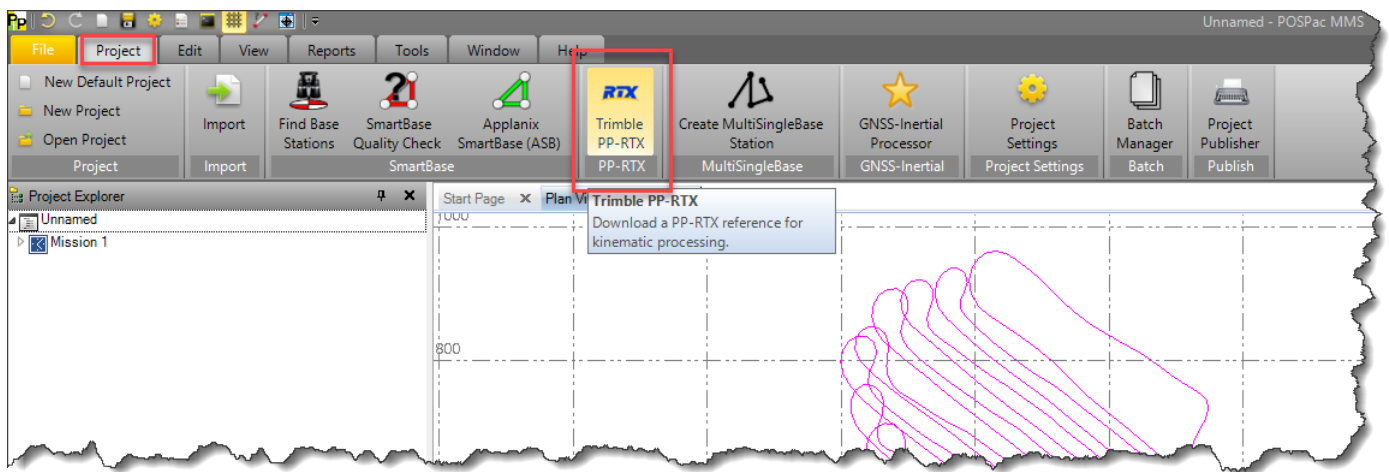- Click on the "Trimble PP-RTX" button in the Project Tab to start the PP-RTX processing:

Figure 5: PP-RTX button in POSPac

- After the PP-RTX basestation is generated and the GNSS QC processor finished the standard processing can be started to generate a SBET solution with the processing mode "IN-Fusion PP-RTX":
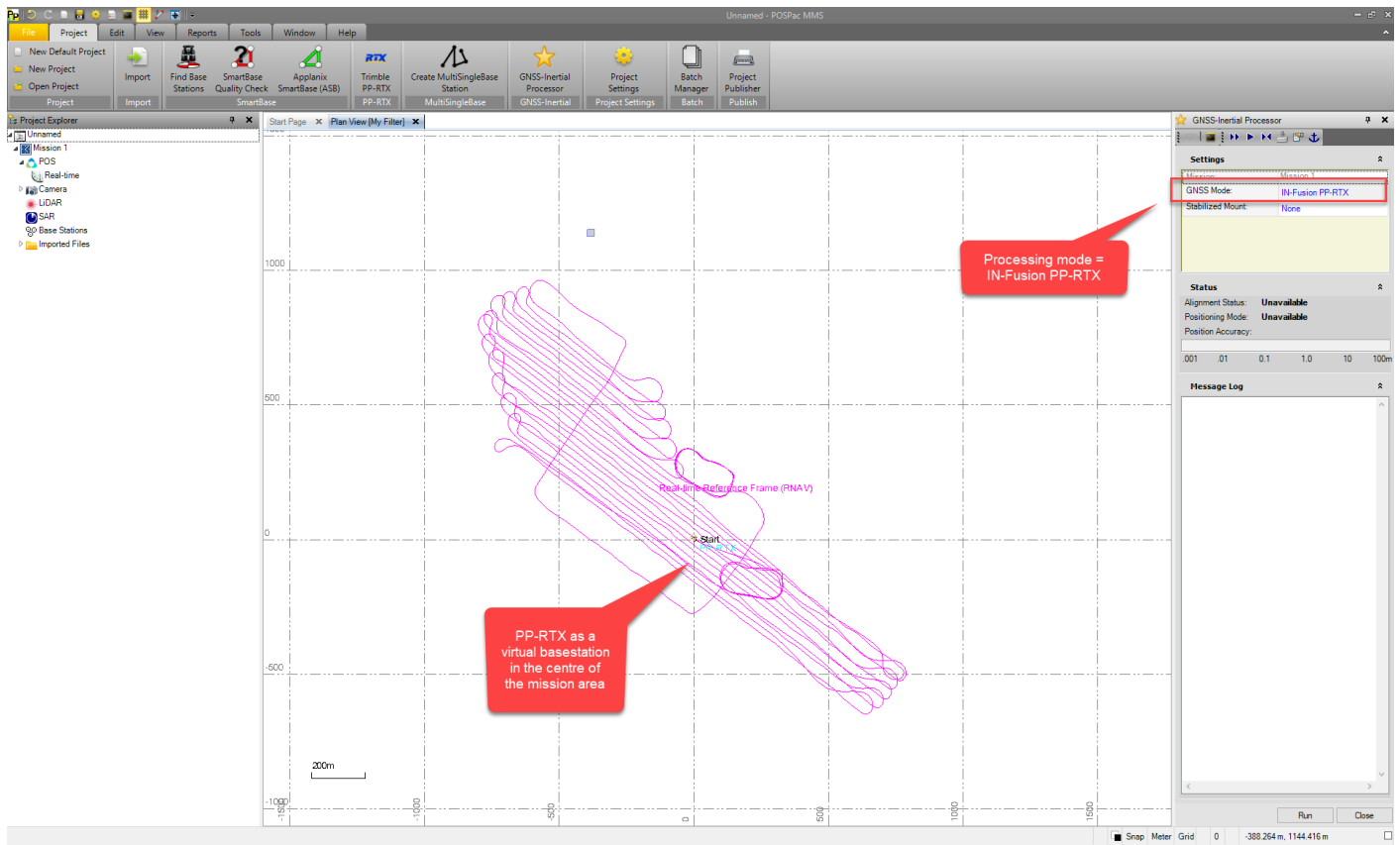
Figure 6: After PP-RTX processing the SBET processing can be performed in PP-RTX mode

For price information and purchasing the PP-RTX subscription license, contact the Applanix Customer Support or visit https://www.applanix.com/products/pospac8/pp-rtx.htm

Reference:

Hutton, Joe & Gopaul, Nilesh & Zhang, X. & Wang, J. & Menon, V. & Rieck, D. & Kipka, A. & Pastor, F.. (2016). CENTIMETER-LEVEL, ROBUST GNSS-AIDED INERTIAL POST-PROCESSING FOR MOBILE MAPPING WITHOUT LOCAL REFERENCE STATIONS. ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. XLI-B3. 819-826. 10.5194/isprsarchives-XLI-B3-819-2016.

10th February 2020 : https://www.applanix.com/news/post-processed-centerpoint-rtx-with-pospac-8.pdf

Trimble RTX coverage Map: https://positioningservices.trimble.com/resources/coverage-maps/