Frequently Asked Questions (FAQ)

1. What is RTN?
   - RTN is a real time positioning network that provides less than a cm accuracy in latitude, longitude, and 2-5 cm accuracy in ellipsoid height at any given time (barring geomagnetic storm/solar flare).
2. What is the datum for the coordinates?
   - 2011 realization of North American Datum of 1983 or NAD 83(2011), epoch 2010.0
3. Do you need a geoid model to receive orthometric height?
   - Yes, the default output of Montana RTN is latitude, longitude, and ellipsoid height. You need a NGS geoid difference model installed in your software to receive orthometric height. We recommend using the latest geoid model which is GEOID18.
4. How does RTN work?
   - It is a network of base stations connected with a central processing unit that provides correction to the rover receiver (remove/model errors from signals that come from the GNSS satellites at an altitude of >20,000 km down to GNSS receivers). The stations in the RTN are called nodes.
5. What is the name of the RTN software?
   - Montana RTN is run on Trimble's Pivot software which is hosted in Trimble's cloud server.
6. What is the use of it?
   - Provides a common correction on national datum for the entire state with improved accuracy, and city and county maps will have less conversion errors.
   - Machine guidance for grading or superelevation, construction and transportation for critical engineering infrastructure, land surveying, precision agriculture, energy & utility, mining, drones, and robotics.
7. When did the Montana RTN take off?
   - March 12, 2022.
8. Who owns Montana RTN? Who are the partners in establishing RTN?
   - State of Montana owns Montana RTN.
   - Montana Department of Transportation (MDT), Tribal Nations, City & County, University; MDT being the major partner for establishing bulk of base stations. 15 stations from UNAVCO are added to the network as well.
9. What is the name of Montana RTN?
   - Montana State Reference Network (MTSRN)
10. How do you create an account with MTSRN?
    - Anyone can apply through MTSRN website www.mtsrn.org, or can email to RTN coordinator, karifuzzaman@mt.gov
11. How does a rover connect to MTSRN? How does MTSRN work?
    - MTSRN provides RTN correction through NTRIP (Network Transport of RTCM via Internet Protocol) which supports wireless internet access through any mobile IP networks (GSM or CDMA).

- There are NTRIP clients in most survey/mapping grade rover receivers/data collectors with standard fields to enter NTRIP IP/Port along with login credentials.
- User can login to MTSRN website (www.mtsrn.org) using the same login credentials.

12. What can a user do in MTSRN website?
    - Check the sensor (base station) map, station health and information including its coordinates.
    - Ionospheric information as well as see the scatter plot of station position.
    - Download static data for any station in the network using Reference Data Shop.
    - Upload and process data using Online Post Processing service.
    - Check the work done through VRS iScope.
    - Check the rovers' current position through VRS iScope Live.
13. What is VRS in RTN?
    - Virtual Reference Station (VRS) is a station created close to a Rover Receiver as if this virtual station is providing the correction to the rover.
14. What is mountpoint?
    - A VRS solution format, or a single base broadcast format provided by NTRIP caster is called a mountpoint. A NTRIP client rover connects to a mountpoint and receives correction from the specific mountpoint.
15. What is subnet?
    - Long separation between stations prohibits creating network solution. Subnets are formed to create network solution using a cluster of closely spaced base stations.
16. How many subnets exist in the Montana RTN?
    - There are currently five (5) subnets in the network.
    - These are named geographically such as, NEMT for northeast Montana, or SCMT for southcentral Montana.
17. What are the names of the existing subnets?
    - NEMT, NCMT, NWMT, SWMT, and SCMT
18. What kind of solution format one can expect from subnets?
    - VRS is the name of network solution
    - VRS follows subnet name, such as NEMTVRS, or SCMTVRS
    - To differentiate between Trimble proprietary solution or international standard solution format, suffixes are added. For example, CMRx suffix is added (NWMTVRSCMRx) to indicate Trimble proprietary multi-constellation solution, and MSM suffix is added (NWMTVRS_MSM) to indicate multi-constellation non-proprietary international solution format.
    - International standard (RTCM3.1 - RTCM3.3) solution format is compatible for any rovers built in last decade.
19. I have a GPS only receiver. Can I use this receiver to receive correction or connect to any mountpoint?
    - CMR+ and RTCM3.1 are Trimble proprietary and international solution format respectively for GPS/GLONASS only receivers.

- In MTSRN, for example mountpoint NEMTVRSCMR is added to indicate CMR+ , and mountpoint NEMTVRSRTCM3 to indicate RTCM3.1 VRS solutions.
- Single base solution, for example BKFB is added to indicate CMR+ and BKFB_3 to indicate RTCM3.1 solution.

20. How many stations are required to complete the network?
    - About 120 stations. However, it might change depending on the NGS recommendations of spacing geometry, relief discrepancy (gravity dependent), and availability of construction sites and needs.
21. What is the business model for Montana RTN?
    - Under a study grant, Montana State University, Bozeman provided recommendations about Montana RTN. It emphasized on partnership model along with a competitive subscription fee for a sustainable RTN.
22. Is the subscription fee implemented for Montana RTN?
    - Montana RTN is currently running under Pilot and free of charge, and this will be extended until the end of current fiscal year.
    - Subscription fee will be implemented from next fiscal year which is 2023-24.