Global GNSS Correction Service

Why TopNETlive

Technology Overview

About Topcon
What is TopNET live?
TopNETlive supplies a wide range of global GNSS correction services, with a variety of subscription packages, designed to meet the unique needs of our customers by providing accurate and reliable positioning information.

TopNETlive is a real-time GNSS correction service delivering high quality data to GNSS receivers used for surveying, construction, GIS, mapping, OEM, system integrators and agricultural applications on a worldwide scale. Fully interoperable with all makes of network capable rovers, subscriptions are made easily available through the TopNETlive website.

Topcon Positioning Group operates and monitors all TopNETlive networks. Topcon’s geodetic specialists and professional standards ensure high quality correction data is globally delivered to each GNSS receiver.
Construction

Eliminating on-site base stations, TopNETlive is increasingly employed in high-profile construction projects. Large highway construction projects, airport runways and machine control operations all benefit from the reliable accuracy and performance of TopNETlive GNSS reference networks.

Agriculture

TopNETlive networks deliver consistent, high-precision positions to precision agriculture machines used in applications across the crop cycle such as soil preparation, seeding and crop care. Equipped tractors, sprayers, spreaders and harvesters benefit from fast initializations and reliable positioning any time of the day or night.
Survey
TopNETlive delivers high-accuracy positioning to professional surveying and engineering applications such as land surveys, engineering surveys, GIS and mapping. TopNETlive removes the need for individual base stations, dramatically increasing production and safety.

OEM – System Integrators
TopNETlive is a global positioning correction service for system integrators, product designers and OEMs. It is ideal for scalable, precision GNSS positioning needs for applications such as automotive, Industrial IOT and autonomous robotics.
Technology Overview
In order to provide precise positioning accuracy, a GNSS receiver needs to compensate for inaccuracies caused by satellite constellations, receiver hardware and atmospheric conditions. These inaccuracies can be calculated by a network of fixed reference stations that constantly receive GNSS data. This correction information is then broadcast to GNSS receivers as a correction service. TopNET/live is Topcon’s GNSS correction service and consists of the reference station network, the correction calculation software and the correction broadcast service.
Real-Time Kinematic (RTK)
Real-Time Kinematic (RTK) is a positioning method to enhance the precision of position data derived from satellite-based positioning systems. RTK works through a network of stations covering local countries. Single Base RTK provides fast and accurate correction from one specific or nearest reference station. Network RTK delivers the correction from a number of stations in a local network of reference stations.

Precise Point Positioning (PPP)
Precise Point Positioning (PPP) is a positioning method to calculate precise positions up to few centimeter level using a single receiver in a global reference framework. PPP delivers great accuracy with slower start-up speed, but provides service anywhere on the planet, independent of local networks.
Both types of networks offer advantages and disadvantages. That is why Topcon designed and developed a service to provide its customer access to both systems simultaneously, even switching between automatically as reception changes. This means the customer always has the best of both systems and a truly global service.

### Constant Coverage

<table>
<thead>
<tr>
<th>Network RTK</th>
<th>PPP</th>
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<tbody>
<tr>
<td>Provides survey-grade accuracy</td>
<td>Global coverage</td>
</tr>
<tr>
<td>Quick start-up</td>
<td>Seamless coverage – just one subscription required</td>
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<tr>
<td>Requires dense local network</td>
<td>Less accurate than RTK</td>
</tr>
<tr>
<td>Requires individual subscriptions to each network</td>
<td>Slower start-up than RTK</td>
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### Full-Constellation Service

The Topcon reference station network uses all four GNSS satellite systems: GPS, GLONASS, Galileo and BeiDou. This ensures the best accuracy and reliability, often referred to as a full-constellation service.
The TopNETlive correction service is broadcast to customer receivers in two ways:

- NTRIP – The internet, typically using a mobile phone SIM card data link.
- L-Band – Direct communication from a satellite. Customers have both options and can use whichever is most convenient.

As an additional service, the raw data (RINEX) from the networks is available to download. There is also an online correction processing service for specialist applications.
Why TopNETlive?
TopNETlive is a truly global solution, providing correction service anywhere with the combination of global PPP and local NRTK networks.

NRTK networks are operated by Topcon and its partners to provide coverage in all major regions of the world.

Customers can have a single subscription that provides borderless service which automatically switches between NRTK networks.

TopNETlive is managed by Topcon’s own network and geodesy experts, which ensures a precise and reliable always-on service.

Topcon’s OEM GNSS boards can be preconfigured for immediate use by system integrators’ customers, with flexible subscription and licensing options to suit the exact need.

The entire solution is designed to be scalable, so system integrators do not need to limit locations or numbers of customers.
TopNETlive

Topcon manages, operates and monitors all TopNETlive reference networks.

Provides greater accuracy and quick start-up time

SkyBridge

SkyBridge allows subscribers to combine RTK and PPP correction services

StarPoint

Provides the service anywhere on the planet, independent of local networks
## TopNETlive

<table>
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<tr>
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<th>SkyBridge</th>
<th>TopNETlive RTK</th>
<th>StarPoint</th>
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</thead>
<tbody>
<tr>
<td><strong>Correction Type / Delivery</strong></td>
<td>RTK with PPP backup</td>
<td>RTK with NTRIP</td>
<td>PPP with L-Band</td>
</tr>
<tr>
<td><strong>Coverage</strong></td>
<td>Global</td>
<td>Local</td>
<td>Global</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>2-4 cm</td>
<td>2 cm</td>
<td>4-10 cm</td>
</tr>
<tr>
<td><strong>Initialization Time</strong></td>
<td>Seconds</td>
<td>Seconds</td>
<td>10-30 mins</td>
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<tr>
<td><strong>Applications</strong></td>
<td>Surveying, Construction, Machine Control, Agriculture</td>
<td>Surveying, Construction, Machine Control, Agriculture, OEM, Industrial IOT and Autonomous Robotics</td>
<td>Machine Control, Agriculture, OEM, Surveying in Remote Areas, Automotive, Industrial IOT and Autonomous Robotics</td>
</tr>
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</table>
Trust Topcon

Topcon is the ideal partner for developing advanced solutions for your positioning and machine control challenges. Our experience, technical expertise and overall company strength make us uniquely qualified to provide enhanced automation technology and ultimately drive your customers’ productivity to higher levels – along with your market share.

Independent Solutions | Speed To Market | Global Network | Experienced OEM Team
Trust Topcon to get you there faster…and with higher quality positioning and automation solutions tailored to your product strategy.

Independent Solutions
In an industry where many contractual alliances are formed, Topcon remains independent. We have the freedom to develop technologies that best fit your unique product goals. Our custom OEM solutions are all clean-sheet designs, providing enhanced opportunities to differentiate your product from the competition.

Speed To Market
Product development carries an inherent pressure to do everything faster and better than before, particularly since technology is only viewed as innovative if it arrives before the competition. Topcon’s experience helps to simplify and shorten the design process, allowing you to go to market with your product faster – and with the utmost confidence.
Experienced OEM Team
Our experienced OEM team knows what questions need to be answered first and the potential pitfalls to be avoided along the way. Their first objective is to make sure our technology is the right fit for your application, and then to be your partner every step of the way.

Global Network
With an extensive worldwide network of corporate offices, R&D centers, and technical groups, we have an unmatched capability to assist any manufacturer, no matter where they are located, with fully integrated machine automation solutions. This also positions us to create programs to assist and support your dealer networks, directly or through extensive training programs.

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