Title: **Improving Accuracy and Redundancy with GPS and GLONASS PPP**

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Abstract

Developments in satellite positioning technologies have seen continual improvements in the robustness and accuracy which is a key requirement in dynamic positioning. Precise Point Positioning (PPP) is a positioning technique developed over the last decade which is used extensively throughout the industry to delivery decimetre accuracy on a global basis.

PPP is an absolute positioning technique which corrects or models all Global Satellite Navigation System (GNSS) error sources such as satellite orbit, satellite clock, troposphere, ionosphere and multipath. The advantage of the PPP technique is that it consists of a single set of 'globally applicable' corrections to the satellite orbits and clocks which means that position accuracy is maintained regardless of user location.

Primarily, the GPS system has been used exclusively for satellite positioning due to the fact that it has been the only system with sufficient satellites available to allow continuous positioning. However, that is changing with the replenishment of the Russian GLONASS system which is gradually moving towards a full constellation of operational satellites.

To date, VERIPOS has used GLONASS corrections as part of it Differential service but with the continual increase in the number of satellites, VERIPOS has now integrated GLONASS into its PPP solution.

This paper looks at the experience of integrating both GPS and GLONASS into a PPP solution which provides global decimetre accuracy. It will present a technical overview of the system from the development of an orbit and clock determination system (OCDS) through to the implementation of user algorithms. The paper will also consider the benefits of a multi-constellation PPP for the user and present positioning results demonstrating the accuracy of the system. Benefits that the user will see is improved availability through more satellites, better accuracy and reliability of the position solution and the possibility of independent position solutions.

Also considered is the fact that currently the visualisation of satellite positioning systems in many cases assumes a GPS-only position is derived. To ensure that users can benefit from the advances in GNSS systems, through use of multi GNSS constellation solutions and independent GNSS constellation solutions, the DP and the service providers have to work together to optimise the interfaces between their systems.

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