This paper assesses the potential of using BDS and GPS signals to position in challenged environments such as indoors. Traditional assisted GNSS approaches that use code phase as measurements (i.e., coarse-time solutions) are shown to be prone to multipath and noise. An enhanced approach that has superior sensitivity and positioning performance—the so-called direct positioning receiver architecture—has been implemented and evaluated using live indoor BDS and/or GPS signals. Real indoor experiments have been conducted in Shanghai and significant improvement has been observed with enhanced approaches: results with BDS constellation show better horizontal positioning performance (biases are less than 10m) than using GPS alone, but are slightly worse in the vertical axis; when using the enhanced approach with BDS and GPS, both horizontal and vertical axes show promising results for the environments considered herein; the coarse-time state converges faster and is more reliable compared to other solutions.