What are some of the initial factors to consider when comparing the different GNSS receivers available on the market today?

**Jason Hamilton (JH):** Finding the right component for your system is critical to the success of your product. With a wide variety of GNSS products on the market, the choice can be confusing — so it is very important to clearly understand what technologies are available. In addition to the technical aspects of a GNSS receiver, some of the factors to consider include:

- the functionality your application requires;
- the suitability of the vendor to your needs as an original equipment manufacturer (OEM); and
- the ease of product integration.

**Let’s start with the technical aspects.**

**JH:** Much depends on the application and the kind of end-user product into which the receiver will be integrated. Some of the specifications to keep in mind are listed in the survey, but the importance and the trade-offs between them can be complex.

For example, trade-offs between size and accuracy may need to be weighed. Finding the best fit for your product requires understanding what is good enough for your application. A receiver that is under-featured will not suit your application’s needs, and an overfeatured product will not meet the cost targets for your market.

**What differentiates receivers?**

**JH:** There is a wide array of receiver options available on the market today. Single-frequency offerings are available at low cost, and provide accuracy appropriate for many commercial and consumer applications. Low-cost offerings are available at the chip or receiver board level, depending on the needs of the application. There are many vendors to choose from for a low-accuracy receiver.

If precise positioning is needed, look for products that offer multi-frequency support and differential positioning modes. These products tend to be at the board level, and are differentiated by their physical dimensions (size, weight, temperature range), interface options (UART, USB, Ethernet) and signal tracking capabilities.

In addition, precision receivers are differentiated by the quality and robustness of their positioning algorithms. This is something that is not possible to evaluate in the receiver survey, and highlights the importance of evaluating any product before you commit. These differences can have a significant impact on the performance of the receiver in your application, especially if the receiver has not been used in a specific application segment before.

Given the complexity of GNSS products, the reputation of the vendor, plus the support provided in terms of technical integration, documentation and customer support, can almost be as important as the product itself.

**What drives the accuracy of a GNSS receiver solution?**

**JH:** Understanding the accuracy requirements of your application is critical to choosing the right receiver. Accuracy of the solution output by the receiver is dominated by a few key factors:

- **What satellite signals are tracked.** Code-only receivers are limited to meter-level accuracy, whereas higher-end receivers that provide accurate carrier-phase measurements allow for cm-level, real-time or post-processed position determination.

- **How precisely the receiver measures the satellite signals.** The code and carrier measurement accuracy directly correlates to the accuracy of the final solution.

- **How well the receiver mitigates the effects of multipath.** Manufacturers have patented techniques to mitigate the effect of multipath on the satellite measurements. A good example is NovAtel’s Pulsed Aperture Correlator (PAC)”™ technology.
What, if any, correction sources the receiver can accept. The highest end of receivers accept locally generated as well as network RTK corrections, to achieve accuracy levels in the cm range. Also make sure to check inter-operability of your selected receiver to make sure it operates with corrections from other manufacturers. Not everyone will make the same receiver selection as you, so make sure your selected receiver is as inter-operable as possible. Manufacturers like NovAtel offer convenient upgrade of functionality in the field, so that users can upgrade their position accuracy when needed by changing the receiver firmware.

**How important is being future-proof?**

JH: There are many exciting developments coming in the future for GNSS navigation. Modernized signals for GPS, the increased investment in GLONASS, the upcoming deployment of new constellations like GALILEO and COMPASS, and new localized satellite positioning systems will dramatically increase the options for receiver manufacturers — and increase capability for users.

New signals broadcast from space will result in signal combinations that will provide more robust positioning. More satellites to track at one time will improve the availability of precise GNSS positioning in challenging conditions where satellite signal blockage occurs.

You should ensure that your receiver choice is field software upgradeable (as is NovAtel’s OEM6 series of receivers, for example) so new signals can be used as they launch. This will allow your customers the opportunity to take advantage of new signals without interruption of operation.

Many manufacturers are working toward receivers that track all frequencies and signals planned for the coming years, but there are differences among the manufacturers and trade-offs to be considered.

For example, the number of channels is a comparison point, but it’s not the complete story. It’s more crucial to find out how configurable the receiver’s channels are, because that defines how many satellites can be tracked simultaneously — and how suitable a receiver will be to operate in the upcoming complex mix of satellite constellations.

The number of simultaneously tracked satellites will improve solution availability, so it should also be considered. Some manufacturers have channels that can be dynamically configured for increased flexibility to handle evolving satellite constellations. For example, the channels on NovAtel’s OEM615 and OEM628 receivers are highly configurable, so that they can adapt as new global and local satellites systems emerge in the future. In the future, products will need to have this flexibility to adapt to whatever satellites are available in the part of the world in which the receiver is being used.

Another point to consider: An increased number of channels can increase power consumption and physical size, so if you have a power-sensitive or size-constrained application, this trade-off should be examined carefully between products.

**Choosing the right vendor**

Just as there are technical considerations for choosing the right receiver, there are factors that should influence whom you choose as your GNSS partner. Some questions to consider include:

1. **Does your vendor compete with you in your market?** A true OEM supplier will support you in winning market share in your market and not show up at your customer with their product.

2. **Does your vendor have a track record for GNSS innovation and leading-edge technology?**

3. **Integrating a receiver into your system can be a complex activity.** Is your vendor set up to support you with the integration effort? Is the product well documented and designed for integration? Does the company have a support structure of application engineers capable with assisting with integration challenges?

4. **Is your vendor a reliable and recognized manufacturer?** As receivers become more complex, only proven manufacturers will succeed in offering high product quality and reliability.

5. **Is your vendor a cooperative part of your supply chain?** Your vendor should support your needs with quick lead times and flexible order fulfillment. NovAtel’s field-upgradeable products allow customers to keep their inventory costs low and offer product flexibility.

6. **Is your vendor financially stable?** The recent recession has been difficult for the GNSS industry. Make sure your vendor is likely to be around to support you with your current product — and to develop innovative, next-generation technology.