Why Trimble Supports GPS Modernization

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Modernized GPS: A platform for innovation

- System Stability
- Operational excellence
- Open, well defined signals
- One example of where modernization can take us
System Stability

GPS operational satellites

Operational Excellence

- Specs from GPS Standard Positioning Service Performance Standard 2001
- This and the other established standards have been met every year since
8 month 2005 GPS anomaly list from USAF Space command

**Anomaly Summary**

- **SVN37 (PRN7):** 3 Apr – Load-shed
- **SVN31 (PRN31):** 14 Apr – Baseband reset
- **SVN27 (PRN27):** 14 May – Rubidium #1 runoff leads to clock swap
- **SVN26 (PRN26):** 9 Jun – Rubidium #1 clock jump
- **SVN15 (PRN15):** 22 Jun – Comparator Reference Value Change
- **SVN32 (PRN1):** 24 Jul – Load-shed
- **SVN26 (PRN26):** 21 Aug – Crypto Variable Upload
Open, well defined signals

- Well-defined signals make a platform for innovation
  - Interface control documents have been widely available throughout the history of GPS
- Raw signals from space rather than prepackage applications enable innovation
  - Nobody had thought of RTK when the system was designed, yet here we are with centimeter performance
Example of innovation driven by modernization
Real time kinematic trades simplicity for accuracy

1. Five satellites needed for RTK

2. Reference measures the carrier signal on two frequencies

3. Measurements sent to rover

4. Extensive computation at rover resolves accurate but ambiguous carrier signal, getting relative position

Known reference point
High accuracy from GPS is widely used in industry

- RTK initialization or re-initialization can take up to 30 seconds
- It is impossible to hide this from the user
  - Not a problem for high value applications, like farming and construction
- High accuracy for general use depend on simplicity
  - Lower prices will follow
GPS Modernization can make precise location ubiquitous

- 3 frequencies will dramatically reduce the initialization/re-initialization time
- Combined with wireless corrections, the underlying complexity can be hidden from the user
- Accuracy and simplicity will go hand-in-hand
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- Operational excellence
- Open, well defined signals
- Innovation will deliver more uses that are not yet foreseen