The new results of GNSS Time Offsets Monitoring and the Opinion about MGET and xGTO

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01 BDS and the other GNSS Time Offsets Monitoring

02 Consideration about the MGET and xGTO
1. BDS Time Offsets Monitoring

Three methods For GNSS Time Offsets Monitoring

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1.1. Single Station method and GNSS time offsets differential station

The reference signal: a clock
Factors: Receiver, Signal quality, Environment, the reference clock, prediction algorithm,…

The reference signal: UTC(k)
Factors: Receiver, Signal quality, Environment, UTC(k), prediction algorithm,…

Relative time offsets between two GNSS time

Absolute time offsets between GNSS Time and UTC(k), UTC(k) is used as a differential station.
1.2 UTC(NTSC)-GNSS Time

UTC(NTSC)-BDT(sm)  UTC(NTSC)-GST(sm)  UTC(NTSC)-GPST(sm)  UTC(NTSC)-GLNT(sm)

November 28, 2018-----May 18, 2019
1.3 BDT-GNSS Time

November 28, 2018------May 18, 2019
1.4 BDS Time Service

3.3 Time System

The BeiDou Navigation Satellite System Time (BDT) is adopted by the BDS as time reference. BDT adopts the international system of units (SI) second as the base unit, and accumulates continuously without leap seconds. The start epoch of BDT is 00:00:00 on January 1, 2006 of Coordinated Universal Time (UTC). BDT connects with UTC via UTC (NTSC), and the deviation of BDT to UTC is maintained within 50 nanoseconds (modulo 1 second). The leap second information is broadcast in the navigation message.

Time Interoperability

 GNSS ID is used to identify different navigation satellite systems, and its definition is as follows: 000 indicates not available; 001 indicates GPS; 010 indicates Galileo; 011 indicates GLONASS; 100 to 111 are reserved.
2. Consideration about the MGET and xGTO

Discussions and analysis on MGET and xGTO

A lot of important questions are not clear:

➢ who is responsible for the calculation of MGET,
➢ what data is needed for calculation,
➢ whether it will increase the operating cost of the system, ...

➢ About independence of the GNSS

    The time offsets parameter will become the basic parameters of the system. If MGET is adopted, once the parameter acquisition fails, the independence of GNSS system would be affected.
2. Consideration about the MGET and xGTO

- The advantage of MGET and xGTO
  - According to the report of Russian experts at the timing workshop and ICG13 conference in 2018, they did not find the important advantages of MGET and xGTO.
  - For the Chinese experts, the similar conclusion.
2. Consideration about the MGET and xGTO

➢ Do we really need more time scales?

• Current important time scales: UTC/UTCr, TAI, TT, UTC(k), GNSS System Time, ...

• The navigation system time is indirectly traced to UTC through UTC(k), and if the performance of UTC(k) is good enough, that is, UTC-UTC(k) is small enough, then GNSS Time offsets could be obtained by UTC.

• But, it is not real time!
2. Consideration about the MGET and xGTO

➢ Real-time GNSS time offsets monitoring---- single-station

• If the needs of the system broadcast parameter update period are taken into account, the single-station time offsets monitoring technique can be adopted.

• The UTC-UTC(k) and GNSS T-UTC(k) data can be used to verify the result of the single station method.
THANK YOU!

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