### GPS timestamps and UHDAS

For a GPS device, we have:
- UHDAS clock time when the message came in ($PYRTM$)
- GGA (NMEA ascii) time

<table>
<thead>
<tr>
<th>GPS Timestamps</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>$PYRTM,2018,321.6111238,7.2692157$</td>
<td>(14:40:01.09)</td>
</tr>
<tr>
<td>$INGGA,144001.10,6759.823526,N,00517.812805,E,xxx*7C$</td>
<td></td>
</tr>
<tr>
<td>$PYRTM,2018,321.6111354,7.2692273$</td>
<td>(14:40:02.09)</td>
</tr>
<tr>
<td>$INGGA,144002.10,6759.824811,N,00517.808622,E,xxx*76$</td>
<td></td>
</tr>
<tr>
<td>$PYRTM,2018,321.6111469,7.2692389$</td>
<td>(14:40:03.09)</td>
</tr>
<tr>
<td>$INGGA,144003.10,6759.826123,N,00517.804919,E,xxx*55$</td>
<td></td>
</tr>
</tbody>
</table>

#### Plot this
- INGGA (now - previous)
- PYRTM (now-previous)
- INGGA-PYRTM

#### Learn this
- Are there missing messages?
- Do the timestamps vary from 1Hz?
- Does the computer clock match GGA?
Examples showing

- **Good**:  
  - all GGA messages coming in, no gaps  
  - Computer clock is stable  
  - It's OK if it is drifting, just not being jerked around
- **OK**:  
  - Buffered messages (latency, then “catchup”)  
- **Bad**:  
  - missing GGA messages  
- **Ugly**:  
  - computer clock jerked around  
  - GGA messages step backwards or repeat (sawtooth)
Pelican Furuno

$GPGGA,024233,2857.2530,N,08912.9878
$GPGGA,024234,2857.2529,N,08912.9875
$GPGGA,024235,2857.2529,N,08912.9872
$GPGGA,024235,2857.2531,N,08912.9870     duplicate times
$GPGGA,024236,2857.2533,N,08912.9866
$GPGGA,024238,2857.2534,N,08912.9860
$GPGGA,024239,2857.2534,N,08912.9856
$GPGGA,024239,2857.2535,N,08912.9856     duplicate times
$GPGGA,024241,2857.2534,N,08912.9856
$GPGGA,024242,2857.2533,N,08912.9854
$GPGGA,024243,2857.2534,N,08912.9849
$GPGGA,024243,2857.2535,N,08912.9844     duplicate times
$GPGGA,024245,2857.2537,N,08912.9840

this message is missing

duplicate times
Notes:

- Names are not hidden to protect the innocent
- all variables are plotted against time
Revelle

- Seapath is fine (good)
- GP90 consistently buffering (OK)
- ADU5 erratically buffering, gaps in time (ugly)
ntpd=True

RR1812_from_SIO

GPS=GP90

timestamp differences: GGA - UHDAS system

UHDAS system time: first difference

GGA: first difference
ntpd=True

RR1812_from_SIO

GPS=ADU5

timestamp differences: GGA - UHDAS system

UHDAS system time: first difference

GGA: first difference
Atlantis

- CNAV was **good**
- GPS-1850 buffering (for a chunk of time) (**OK**)
one message per day is a little late so there is a longer gap and a shorter gap in the UHDAS times all GGA messages arrive no gaps in GGA times
Latencies and short arrival times at UHDAS so there is buffering of the messages.

A few gaps in GGA messages.
Hugh Sharp

- no NTP – computer clock is drifting
- no problem
- no buffering

good
UHDAS clock drifting compared to GGA
Oceanus

- “GPS” feed good
- ADU5 feed good
- ADU800 – backwards time step (ugly)
- NTP was glitchy
  ugly (because of ntp)
jerky differences between UHDAS and GGA: ntp (server) was misbehaving?

one missed message

a little wiggle in the arrival times

one missed message

one stop/start logging
GPS=ADU800

**ntpd=True**

**oc1806a**

*timestamp differences: GGA - UHDAS system*

*UHDAS system time: first difference*

*GGA: first difference*

**VERY BAD**

**jerky differences**

between UHDAS and GGA: ntp (server) was misbehaving?

one stop-start logging

a little wiggle in the arrival times

one missed message

one stop/start logging

one backwards timestamp
Healy

- Trimble: regular buffering of GGA messages
- merely OK
- 5 times per day
- latencies of 2 sec
- shorter arrival times
- very few missing GGA messages
- no repeated timestamps
Sproul

- GP10 consistently buffering
- merely OK
ntpd=True

SP1915

GPS=GP170

timestamp differences: GGA - UHDAS system

UHDAS system time: first difference

GGA: first difference
Thompson

- CNAV messages regularly lost (bad)
- repeated timestamp (ugly)
ntpd=True

TN366_incomplete

GPS=CNAV

Gaps in GGA times
One repeated timestamp
Endeavor

- ntpd is running (computer clock not drifting)
- ADU5: times are (usually) OK (good)
- ADU2: lost messages, irregular buffering (bad)
- Norstar: ugly
  - a few lost messages,
  - one backwards time step
  - resets once per day
ntpd=True

EN642

GPS=ADU5

timestamp differences: GGA - UHDAS system

UHDAS system time: first difference

GGA: first difference
ntpd=True

GPS from ADU2

timestamp differences: GGA - UHDAS system

UHDAS system time: first difference

GGA: first difference
GPS from Norstar GPS

timestamp differences: GGA - UHDAS system

UHDAS system time: first difference

GGA: first difference
ntpd=True

GPS=Norstar

timestamp differences: GGA - UHDAS system

UHDAS system time: first difference

GGA: first difference
Atlantic Explorer

- Simrad MK12 resets every day (ugly)
ntpd=True

AE1917

GPS=Simrad MK12

timestamp differences: GGA - UHDAS system

Zero PC clock drift
Computer is on NTP
Pelican

- UHDAS clock not using ntp (drift 1 sec/day)
- Furuno time resets every day (*ugly*)
- Furuno time resets by
  - missing message
  - repeating timestamps
ntpd=True

PE19_13_Sidorovskaia

GPS=ADU800

timestamp differences: GGA - UHDAS system

UHDAS system time: first difference

GGA: first difference
**ntpd=False**

- GGA times are reset every day at 00UTC. During the "reset"
  - messages are lost
  - timestamps are duplicated

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**GGA from furuno**

**GPS=Furuno**

*timestamp differences: GGA - UHDAS system*

- Pink line = drift of UHDAS clock
- (UHDAS computer not using any timeserver)
- This drift is dealt with in processing.

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**UHDAS system time: first difference**

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**GGA: first difference**