How many Times fit in one Sync?

Karl Weber, ZHAW

IEEE 802.1 Meeting July 2012

A list of times (as examples)

School of Engineering
InES Institute of Embedded Systems

- Abstract: TAI and UTC (not quite the same – leap s!)
- GPS, Radio and Atomic time (… ns away)
  (➔ 4 satellite systems 4new satellite clocks are under way)
- Grid time including deviation from nominal frequency
  (➔ several regions as EuropeC, GB, Baltic + 50Hz vs. 60 Hz)
- Operational time of a plant, machine or component
  (➔ PV converter modules included)
- Wall clock (NTP, Radio) timestamping logging data etc
- AV transmission or control loop period
  (➔ there may be many of them >100 in some plants)
  (hierarcial structures but sometimes interleaved)
- Different domains with different requirements ➔

GPS Deviation 1

School of Engineering

InES Institute of Embedded Systems

PRN	MJD	hm	MC-GPS[ns]
2	56125,067	130	1,1
4	56125,067	130	10,6
5	56125,067	130	-0,2
10	56125,067	130	7,6
12	56125,067	130	0
13	56125,067	130	4,8
17	56125,067	130	1,7
23	56125,067	130	3,5
2	56125,0781	146	2,2
4	56125,0781	146	11
5	56125,0781	146	0,3
10	56125,0781	146	6,4
12	56125,0781	146	-0,6
13	56125,0781	146	5,8
17	56125,0781	146	0,9
23	56125,0781	146	0,5
25	56125,0781	146	-4
2	56125,0892	202	2,9
4	56125,0892	202	11,4
5	56125,0892	202	1,9
10	56125,0892	202	2,9
12	56125,0892	202	0,8
13	56125,0892	202	6,6
17	56125,0892	202	3
23	56125,0892	202	-2,9
25	56125,0892	202	-2,8

Data taken from
ftp://tycho.usno.navy.mil/pub/gps/usnogps1.dat
At July 18 2012

Timing Data for Individual GPS Satellites (Single frequency C/A code)
USNO Format *format explanation*
Most recent 1 Day

GPS Deviation 2

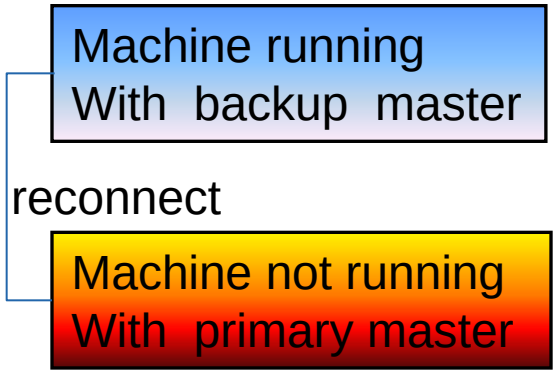
School of Engineering

InES Institute of Embedded Systems

PRN	MJD	hm	MC-GPS[ns]
2	56125,1004	218	-68,9
4	56125,1004	218	-251,8
5	56125,1004	218	-210,3
10	56125,1004	218	-199,9
12	56125,1004	218	-254
13	56125,1004	218	-451,6
17	56125,1004	218	-307,1
23	56125,1004	218	**-856,9**
25	56125,1004	218	-476,1
2	56125,1115	234	-196,5
4	56125,1115	234	-272
5	56125,1115	234	-195,8
10	56125,1115	234	-211,9
12	56125,1115	234	-253,6
13	56125,1115	234	-470,7
17	56125,1115	234	-295,7
25	56125,1115	234	-425,3
2	56125,1226	250	-196
4	56125,1226	250	-293,5
5	56125,1226	250	-187,5
10	56125,1226	250	-230,9
12	56125,1226	250	-258,3
13	56125,1226	250	-503,4
25	56125,1226	250	-390,7
29	56125,1226	250	-578,9
2	56125,1337	306	-195,4
4	56125,1337	306	-315,8
5	56125,1337	306	-181,7
10	56125,1337	306	-258,4
12	56125,1337	306	-266
13	56125,1337	306	-558,4
25	56125,1337	306	-369,1
26	56125,1337	306	-211,6
29	56125,1337	306	-473,1
2	56125,1448	322	-196,3
4	56125,1448	322	-337
5	56125,1448	322	-179,4
10	56125,1448	322	-295,1
12	56125,1448	322	-272,2
13	56125,1448	322	-641,3
25	56125,1448	322	-357
26	56125,1448	322	-227,5
29	56125,1448	322	-391,1
2	56125,1559	338	-198,4
5	56125,1559	338	-180,1
10	56125,1559	338	-343,6
12	56125,1559	338	-275,1
13	56125,1559	338	-764,3
25	56125,1559	338	-352,8
26	56125,1559	338	-227,7
29	56125,1559	338	-326,8
2	56125,167	354	-109,7
4	56125,167	354	12,7
5	56125,167	354	6,5
10	56125,167	354	5,1
12	56125,167	354	12,6
25	56125,167	354	6,9
26	56125,167	354	14,4
29	56125,167	354	6,9
2	56125,1781	410	5,7
4	56125,1781	410	6,1
5	56125,1781	410	6,4
10	56125,1781	410	-2,6
12	56125,1781	410	14,8

Different requirements

- Highest precision required at the low end systems
  …lowest accuracy if syncronized from a center point
  <100ns sync at frequency converter level required
- Must run sometimes more important than global sync
- Never resync a running machine…
  example tandem printing machine
  can operarte on a single row



➔Robustness is a very important issue
… change of sync patterns is the most critical issue