Synchronisation and Timing – SKA1

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Synchronisation – Todays Systems

- Synchronisation from H-Maser + local OCXO.
  - 1ps r.m.s. stability in 1 sec coherence time
    - 1% max coherence loss during a correlator integration period or a coherent addition @ 22 GHz max frequency.
  - 2 ps r.m.s. stability in 100 sec
    - 2% max coherence loss when integrating on a calibration source.
  - 10 ps r.m.s stability in 10 minutes
    - to maintain linear phase variation in switched phase reference observations.
- Maintained using round trip phase correction.
- Not absolute time, but relative to the observatory frequency reference.

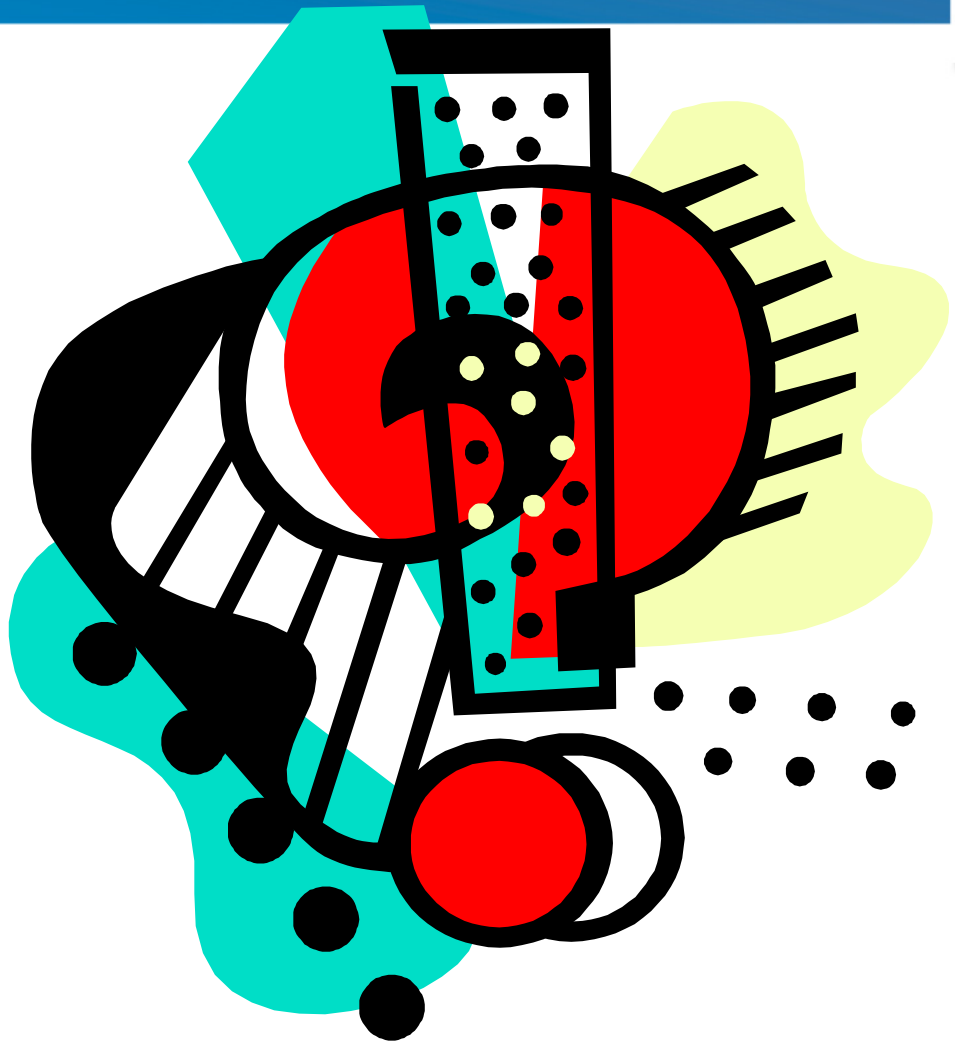
Timing – Todays Systems

- 10 ns accuracy using GPS governed H-maser clocks
  - Tied to UTC framework (based on TAI)
  - Long term stability and referenced system
- Offset tracking (and archive) of time stamp from observatory frequency reference ticks.
- PTP IEE1588v2 sub µs accuracy
- White Rabbit sub ns accuracy
- Common view GPS ns accuracy

SKA1 Derived Requirements

LO Stability	@ 10 GHz max frequency	Notes
r.m.s in 1 sec	3 ps	Max 2% coherence loss in an integration or addition
r.m.s in 100 sec	3 ps	Max 2% coherence loss in calibration
r.m.s drift in 10 minutes	16 ps	Track linear phase between calibration periods
Timing		
Pulsar Time accuracy (now)	~10 ns	GPS Tied to TAI framework
Pulsar Time accuracy (possible)	~1 ns	GPS Common View or White Rabbit

Information TBD

- Requirements not identified?
- Data Exchange Descriptions
  - SaDT: DDBH & SaT
  - MGR
- Cadence of Update of timing information
- Interrupts required (precision)
- Maximum Latency requirements
- Upgradeability?

Comments and Questions