A Standard Grid Timestamp

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i. Motivation

- Timestamps are often needed
  - performance
  - accounting
  - scheduling
  - ..and others
- Timestamps are very similar
- Ad-hoc formats require NxN conversions

ii. Solution: A standard format

- An ASCII format for human-readability and non-binary encoding styles (e.g.: XML)
- A binary format for efficiency
- Important to allow conversion between ASCII and binary formats with minimal loss of information
- Define standard *accuracy* and *precision* information for both

Outline

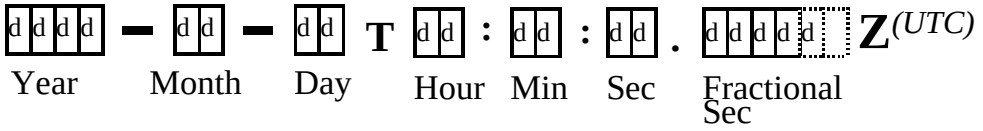
- Timestamp model
- ASCII format
- Binary format
- Issues
- Conclusions and discussion

Timestamp Model

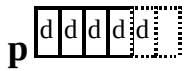
- Time value
  - Time zone = UTC
  - At least 1970 .. 2032 (Unix 32-bit sec since epoch)
  - Roughly picosecond precision
- Precision
  - Definition: Clock ticks per second
- Accuracy
  - Definition: Distance from true time value
  - NTP provides an estimate of this, others don't
  - Suggest creation of "typical" accuracies table

ASCII Format

- Extension of ISO8601
- Value



- Precision



- Accuracy

ASCII Format - Examples

1. October 26, 2000 at 8:34am and 26 seconds, precision = 1ms, accuracy = 1s

   `2000-10-26T08:34:26Zp.001a.5`

2. January 1, 2001 at 3:12pm and 5 seconds, precision = 5s, accuracy = 10min

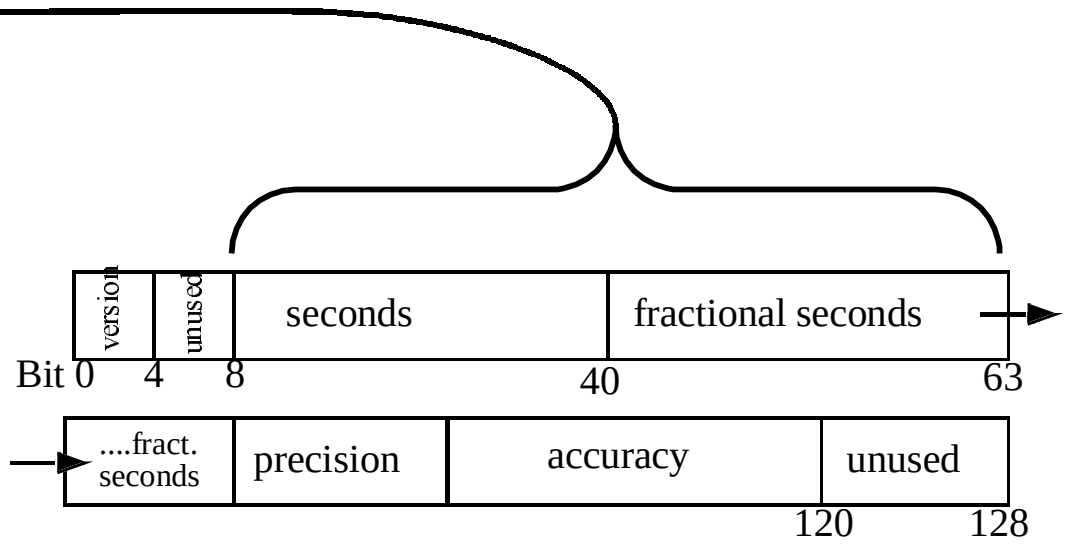
   `2001-01-01T15:12:05Zp5a600`

3. October 26, 2000 at 8:34am and 26 seconds, precision = null, accuracy = null

   `2000-10-26T08:34:26Z`

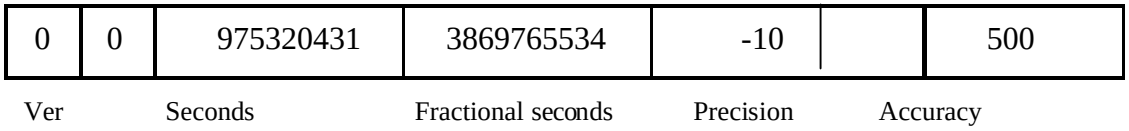
Binary Format

- Value
  - Seconds
    - 32bits
  - Fractional seconds
    - 32 bits
- Precision
  - Log2(seconds/tick)
    - 8 bits
- Accuracy
  - Multiples of precision
    - 32 bits

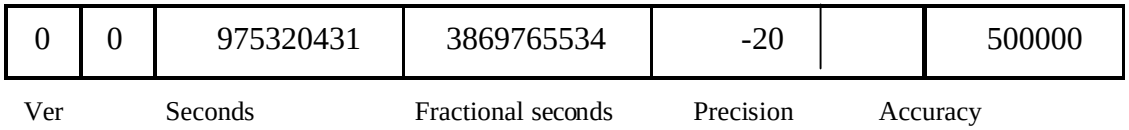


Binary Format - Examples

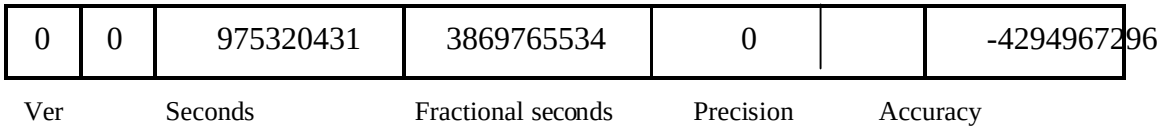
1. November 27, 2000 at 11:21am and 26.901 seconds, precision = 1ms, accuracy = 0.5s



2. Same time, precision = 1E-6s, accuracy = 0.5s



3. Same time, precision = 1s, accuracy = null



Issues

- Timestamp "accuracy" not well-defined
  - NTP provides an estimate
  - Grid Time accuracy table?
- Extensions for time intervals?
  - Maybe t_1 "," t_2 ? Binary ??
- Extensions for time series?
  - (timestamp, offset, offset, …) ?

Conclusions and discussion

- Common timestamp format is useful
- We can reach rough consensus in stages:
  - Model
  - ASCII format / Binary format
- What degree of consensus do we have?