

An Alternative Delta Time encoding for CCNx using Interval Time from RFC5497

draft-gundogan-ccnx-timetlv-00
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Motivation

Constrained Network Characteristics

- ▶ Bandwidth is low and latency is high
- ▶ Link access is slower than intra-stack processing
- ▶ Packet transmission time dominates energy consumption

Header compression reduces energy expenditure (cf. **I-D.irtf-icnrg-icnlowpan**)

CCNx Time Values

Interest

Fixed Header

Hob-By-Hop Headers

- Interest Lifetime

Relative

Interest Message

- Signature Time

Absolute

Data

Fixed Header

Hob-By-Hop Headers

- Recomm. Cache Time

Absolute

Data Message

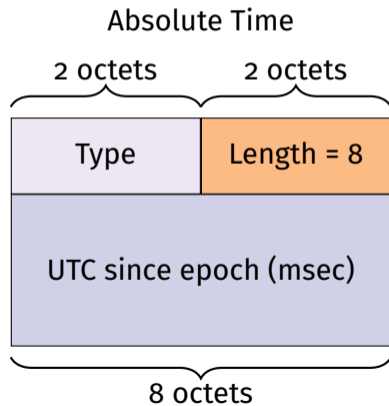
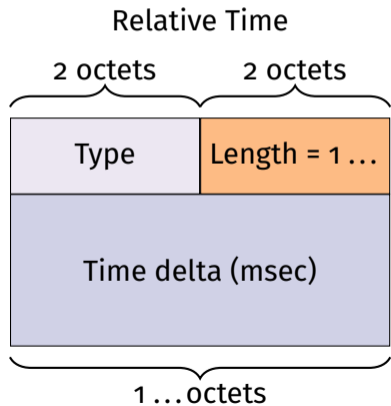
- Expiry Time

- Signature Time

Absolute

CCNx TLV Representation of Time

- ▶ Relative time: delta (milliseconds) with variable length (1 ... octets)
- ▶ Absolute time: UTC (milliseconds) since epoch with fixed length (8 octets)



Compressed Relative Time Representation

- ▶ Support dynamic range inspired by RFC5497
- ▶ Range from milliseconds (high precision) to days (low precision)
- ▶ Represent large deltas using **1–2 octets**

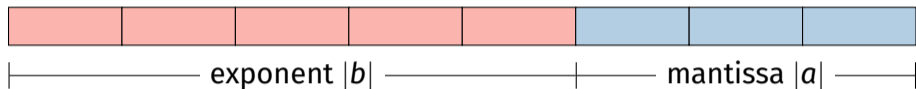


CCNx Integration

- ▶ **If TLV Length == 1 or 2:** TLV uses compressed time representation
- ▶ **Otherwise:** TLV uses normal time representation

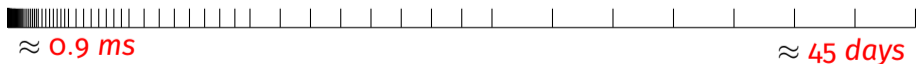
Example Time TLV Configuration

time code using 1 octet



$$\text{time value} = \left(1 + \frac{a}{2^{|a|}}\right) \cdot 2^b \cdot C$$

Example: $|a| = 3$ $|b| = 5$ $C = \frac{1}{1024}$



Absolute Time Compression Challenges

- ▶ Signature time can be far in the past
- ▶ Expiry time can be in the past, or in the future
- ▶ Expiry & Signature time are located in security envelope
 - ⇒ Compressed representation can only be set by originator

Idea: Signature Time as Base Time

Data

Fixed Header

Hob-By-Hop Headers

– **Recomm. Cache Time**

Data Message

– **Expiry Time**

– **Signature Time**

- ▶ Use Signature Time (if present) as base
- ▶ Use time deltas for
Recomm. Cache & Expiry time

Signature Time: Mon 18 Nov 2019 01:53:54 PM UTC

Recomm. Cache Time: Signature Time + 10 minutes

Expiry Time: Signature Time + 20 days

Next Steps

- ▶ Investigate on necessary time range and precision
- ▶ Find optimal values for mantissa $|a|$ and exponent $|b|$
- ▶ Explore ideas on compressed time representation for absolute time

Progress is tracked at:

<https://github.com/icnrg/draft-gundogan-icnrg-ccnx-timetlv>