On Implementing Time
draft-ietf-ntp-implementation-guidance-00

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Motivation

- functionality and security of apps hinges on some notion of time

- choose from multiple clocks on systems

- applications oblivious to implications of choosing one or the other clock for implementation

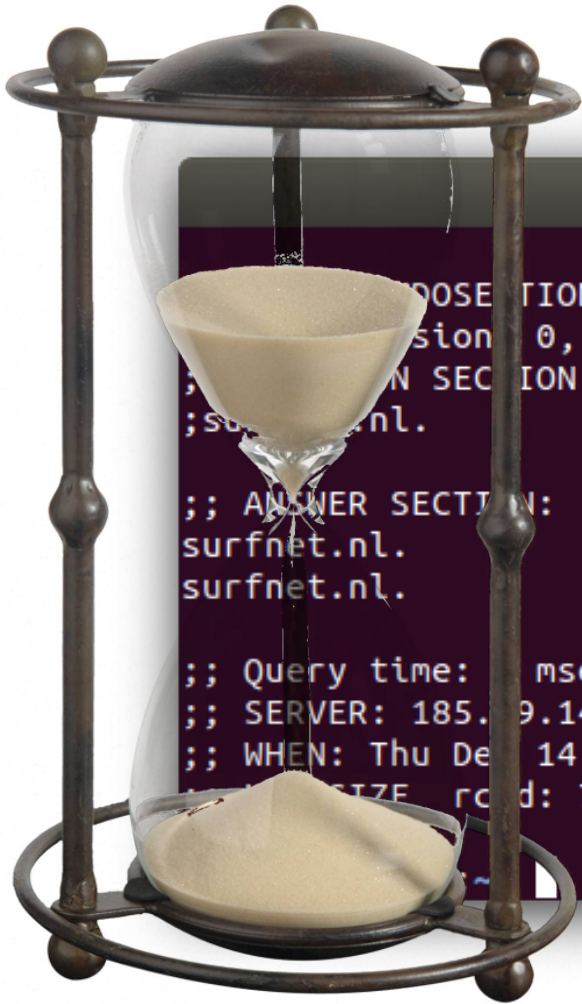# draft-ietf-ntp-implementation-guidance-00
Motivation

- Result from research on effect of NTP weaknesses on DNS(SEC)

  Malhotra, A., Toorop, W., Overeinder, B., Dolmans, R., & Goldberg, S. (2019). The Impact of Time on DNS Security.

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Motivation

```
willem@makaak: ~

OPT PSEUDOSE TION:
; sion: 0, flags:; udp: 4096
; N SECTION:
;surfnet.nl.                    IN      A

;; ANSWER SECTION:
surfnet.nl.            356      IN      A       192.87.108.15
surfnet.nl.            356      IN      A       145.100.190.243

;; Query time:    msec
;; SERVER: 185.  9.140.100#53 (185.49.140.100)
;; WHEN: Thu Dec 14 11:59:10 CET 2017
;;      SIZE  rcvd: 71
```

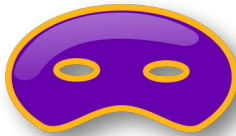TTL (Time to Live) = Relative time

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Motivation

```c
struct RRset_t {
    uint8_t            *dname;
    uint16_t            rrtype;
    uint16_t            rrclass;
    struct timeval      expiry;
    void               *rdata[];
};

if (gettimeofday(&rrset->expiry, NULL))
        perror("Could not get time of day");
else
        rrset->expiry.tv_sec += ttl;
```

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Scope

- Expressing Time
  - methods to express time by applications
  - Absolute vs Relative Time

- Different clocks
  - properties of clocks maintained by digital systems
  - Native Time vs World Time

- trade-offs of using one clock over the other provides guidance to help implementers make an informed choice

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Outline

- Expressing Time

  – Absolute vs Relative Time

- Keeping Time

  – Native Time vs World Time

- Trade-offs of using Native vs World Time

- Current implementation approaches

- POSIX & Windows Example.

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History

- Research results presented at IEPG at IETF100
- `draft-aanchal-time-implementation-guidance-00`
  presented in NTP wg at IETF100
  Issues with terminology
- `draft-aanchal-time-implementation-guidance-01`
  presented in NTP wg at IETF103
  few comments
- `draft-aanchal-time-implementation-guidance-02`
  presented in NTP wg at IETF105