Thesis B.Sc.

Thesis M.Sc.

IDP

Analyzing PTP Master Clocks in the Wild

Motivation

The Precision Time Protocol (PTP) is a clock synchronisation protocol designed for local networks. Compared to the Network Time Protocl (NTP) it promises better accuracy with a sub-microsecond range.

Even though it is specifically designed for local networks, so called master clocks are publicly available in the Internet. Triggered with the correct message, these master clocks start sending PTP messages. As shown in the image, some clocks even initiate a connection that sends 1000 packets with a frequency of 1 pps.

A previous work has shown that clocks with different specifications and accuracies can be found. These clocks are located in different networks accross the globe. While PTP promises a high accuracy in LANs, network influences in the Internet might reduce the effectiveness.

The goal of this thesis is to deploy a local master clock with GPS access, synchronize to remote clocks and analyze the accuracy of time synchronization. Comparing received timestamps to the local GPS time source, allows a precise analysis of synchronization accuracy and potential network influences.

```
▼ Precision Time Protocol (IEEE1588)
  ▶ 0000 .... = transportSpecific: 0x0
    .... 1100 = messageId: Signalling Message (0xc)
    0000 .... = Reserved: 0
    .... 0010 = versionPTP: 2
    messageLength: 56
    subdomainNumber: 0
    Reserved: 0
  ▶ flags: 0x043c
  ▶ correction: 0.000000 nanoseconds
    Reserved: 0
  ▶ ClockIdentity: 0x002590fffed64608
    SourcePortID: 50
    sequenceId: 11918
    control: Other Message (5)
    logMessagePeriod: 127
    targetPortIdentity: 0xfa163efffef671f9
    targetPortId: 1
  ▼ tlvType: Grant unicast transmission (5)
      lengthField: 8
      1011 .... = messageType: Announce Message (0xb
    ▶ logInterMessagePeriod: 1
      durationField: 1000 seconds
      .... ...1 = renewalInvited: True
```

Your Task

- Deploy and analyze a local master clock
- Develop an approach to effectively synchronize to remote clocks
- Analyze the synchronization accuracy
- Analyze network influences over time

Requirements

- Basic programming knowledge in C or Python
- Familiarity with GIYF-Based work approaches

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