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Network Timer Derby Protocol (NTDP): Protocol and Algorithms Specific

Abstract

The Network Time Protocol (NTP) is widely used to synchronize computer clocks in the Internet. This document describes NTP version 4a, Network Time Derby Protocol (NTDP), which is partially backwards compatible with NTP version 4 (NTPv4) described in RFC 5905, NTP Version 3 (NPTv3) described in [RFC 1305](https://tools.ietf.org/html/rfc1305), as well as previous versions of the protocol.

NTDP is created for a mobile platform, namely a Derby Hat. NTDP uses standard NTP protocols to obtain time from Servers. NTDP clients are meant to acquire time primarily using their 5 senses.

NTDP is unique in its output characteristics. When deployed on its intended platform, time and date are displayed in analogue format. The analogue format is not prescribed, but the Reference Design for NTDP uses “dial” style gauges for the analog display, however “arc” style gauges have also been used in the development process. The critical criteria for NTDP is that time be displayed in a non-digital format.

NTDP is always implemented in local time, to facilitate calculation of time to Adult Beverages (TTAB) for local users. When implemented as an NTDB server, this implementation guidance should be maintained. Oops, I just said “should” in an RFC – I meant “will be maintained”. It is the responsibility of the NTDP client to associate themselves with an NTDP server in their time zone.

Introduction

Suggested Modes of Operation

Suggestions and Caveats in Further Development

Further development of NTDP will be focused on different analogue display formats. For instance, pumps could be used to vary pressure to display time in

Piezoelectric mechanisms could be used to drive audio or visible displays. Note that for audio output, volume and frequency are both key considerations. Too much volume could potentially make hat unwearable. Too low a volume would make the time inaudible to any but the wearer of the hat.

The use of hammers, especially to drive a “Test Your Strength” style carnival gauge is discouraged, as NTDP is meant for a wearable (on the head) platform.

Heat is another mechanism that could be used for NTDP. For third party use of the output, this would need to be tied to a thermometer display of some kind. Note again that range is important. If the range is too low or too high, a temperature based implementation of NTDP can easily cause injury to the wearer of the hat. In addition, the use of open flame in temperature based implementations should be avoided, for that same reason.

Constraints and Considerations

Size Constraints

All implementations of NTDP are intended for deployment on a Derby Hat platform. This introduces a size constraint. All implementations must fit on or in a reference sized hat, and all implementations must result in the hat still being wearable.

Safety Considerations

As NTDP outputs are all analog, this means that usage by both the hat wearer and any third parties should be considered in the design and implementation process.

For instance:

For heat based implementations, the temperature range used to represent the various time scopes must be kept to within temperatures considered safe and comfortable for the wearer of the hat.

“Length of Open Flame” (LOF) should be discouraged as an output format in most implementations for the safety of both the wearer and third parties.

Similarly, any pressure or hammer based implementations should consider the safety of the hat wearer. It’s desired that the hat wearer should survive the “noon experience”.

Audio implementations should consider that all parties will need likely want to use their hearing after experiencing the NTDP output. It is recommended that NTDP output be kept to within a range deemed safe. For instance, a 60-70db range has been used during protocol development, and we’re all still fine. If someone would answer that phone we’d be fine anyway! Be sure to use accurate acoustic measurement equipment to define “safe”.

Usability Considerations

As NTDP outputs are all analog, this means that usage by both the hat wearer and any third parties should be considered in the design and implementation process.

For instance:

Audio implementations based on frequency should be implemented within the range of human hearing. NTDP is not meant for dogs or whales. Also consider the for-shortened audio range that most security professionals have, as many are of advanced years, and most have damaged their hearing in any of several ways during mis-spent youth.

Audio implementations based on amplitude must consider that third parties will want to stay outside of the personal space of the hat wearer. Implementations should be in the 60db range (outside the hat) for optimal third party use. See “Safety Considerations” during both the design and implementation processes.

The use of NTDP as a Time Server

NTDP can also be used as a network based time server. Note however that the nature of the output should remain analog. For instance “around noon” is an appropriate output, as is “time for a beer” and “why aren’t you at work?”

“Quarter after two” is considered an appropriate output, but only if it is meant to represent everything from 14:05 to 14:25.

Multiple representations of time are perfectly acceptable for this protocol. Several clients making simultaneous NTDP requests should have no expectation that they will all receive the same response. All responses will be correct, but may or may not be identical. For instance, an NTDP request at 6:20pm might return any of:

* quarter after six
* almost dark (at the appropriate time of year)
* why are you still at work
* fire up the BBQ!

As inferred from the above, an NTDP server should not only take accurate local time as an input, but should also track the local sunrise and sunset times. For instance, “O-Dark-30” is a very appropriate NTDP response, but not in Norway during the summer.

NTDP Server Implementation Specifics

NTDP is referenced using a standard restful API, and will deliver approximate analog time to any web browser, curl, wget or similar tools.

No arguments are required to complete an API call. A simple GET request by the NTDP client will return the appropriate response. Responses are in plain text format, no fields are specified.

NTDP Reference Implementation (python on Raspberry Pi)

The reference implementation of NTDP is on a Raspberry Pi, with a GPS “HAT” to acquire time and location inputs. Visual analog outputs are via Voltmeter-style dial gauges. Digital analog outputs are presented via an open 802.11 SSID.

GPS Interface - Acquiring Accurate Time

Time sources for NTDP servers are the same as for traditional NTP servers. The reference implementation uses GPS to deliver a Stratum One Analog NTDP Time Source.

GPS Interface - Location inputs

As discussed, an NTDP server will track some location specific inputs, specifically:

* Time Zone
* Sunrise and Sunset Times

Reference Python Implementation:

|  |
| --- |
| def min\_out():  def sec\_out():  def hr\_out():  def dow\_out():  def gps\_clock\_in():  def gps\_loc\_in():  def local\_tz:  def sunrise\_time()  def sunset\_time(): |