SCaLE 20x

9-12 March 2023

Network Time Foundation

What's Going On…

NETWORK TIME FOUNDATION

In the Beginning: NTP

NTP is all about a well-defined impulse response

Prof. David L. Mills and a small group of others:

- Feb ‘81, Time Sync in DCNET Hosts, the first report on the first implementation of NTP
- Sep ‘85, RFC958, first NTP Standard proposal
- Jul ‘88, RFC1059, NTPv1 Standard
- Sep ‘89, RFC1119, NTPv2 Standard

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NTPv3

- Mar ‘92, RFC1305, NTPv3 Standard
- xntp3 releases begin
- Jun ‘92, I start using and submitting patches
- Jun ‘94, xntp3.3wy
- Apr ‘96, xntp3.5f, Dave’s last solo release
- Jun ‘96, I start converting the codebase to GNU autoconf and automake
- Oct ‘96, xntp3-5.86.5 release

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NTPv4 …

- Sep ‘97, first alpha release of ntp-4
- Gentle work begins on the IETF NTPv4 draft
- Feb ‘98, ntp-4.0.72
- Jun ‘98, ntp-4.0.73
- Nov ‘98, Last release (EOL) of xntp3-5.93e, and before I had a chance to release the code as xntp3-6, Dave digs in and we have ntp-4.0.90, the first beta release of NTPv4

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… NTPv4 …

- May ‘99, Initial CVS import
- Jan ‘00, ntp-4.0.99
- I dislike CVS; start looking for something better
- Aug ‘01, ntp-4.1.0 new major release, EOL for ntp-4 betas. Move from CVS to Bitkeeper.
- Feb ‘02, ntp-4.1.1 new major release/4.1.0 EOL
- Jul ‘03, ntp-4.1.2 new major release/4.1.1 EOL
- Oct ‘03, ntp-4.2.0 new major release/4.1.2 EOL

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… NTPv4 …

- Jul ‘05, draft-ietf-ntp-ntpv4-proto-00, initial publication of what will become RFC5905
- Jun ‘06, ntp-4.2.2 new major release/4.1.2 EOL
- Dec ‘06, ntp-4.2.4 new major release/4.2.2 EOL
- Sep ‘07, draft-ietf-ntp-autokey-00, initial publication of what will become RFC5906
- Dec ‘09, ntp-4.2.6 new major release/4.2.4 EOL
- Apr ‘10 - Dec ‘11, 5 patch releases to ntp-4.2.6

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… NTF …

The NTP Project had been an amorphous group of volunteers with no “entity” to own gear or collect and spend funds. I’d been thinking about how to solve that problem since 2000 or so. In 2006 I created the NTP Forum at ISC, and worked on that until December, 2010 when ISC shed its unfunded mandates (like the NTP Project). I then created NTF, which got its 501(c)(3) certification in 2011.

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ntp-4.2.8 and beyond

- Dec ‘14, ntp-4.2.8 major release/4.2.6 EOL.
  Contained more than 1100 bugfixes
- Feb ‘15 - Jun ‘20, 15 patch releases
- Apr ‘23, ntp-4.2.8p16 release (OpenSSL-3)

Which brings us to…

- Late ‘23?, ntp-4.4 major release/4.2.8 EOL
  License change to MPL-2.0 expected
  Many new features

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Other NTF: 2011-now

- ‘11?, PTPd joins NTF
- ‘11?, LinuxPTP joins NTF
- ‘11?, RADclock joins NTF
- ‘14, Ntimed started
- ‘17, PTPd leaves NTF
- ‘22, libptpmgmt joins NTF
- ‘22, Khronos joins NTF
- ‘22, Renesas, SyncMonk, Intel SyncE join NTF

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NTF's Consortia

- NTP (NTP Project, Ntimed, Khronos)
- PTP/SyncE (LinuxPTP, libptpmgmt, Khronos, various SyncE efforts)
- GTSAPI (General Timestamp API)
- Time Source (Refclock Vendors, National Time Laboratories, NTP Pool providers and users)

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Khronos Project

Khronos is designed to prevent time-shifting attacks. It monitors sufficient numbers of designated time sources to determine provable bounds on the time — likely better than 200ms.

https://datatracker.ietf.org/doc/draft-ietf-ntp-chronos/

Supporting Consortia: NTP, PTP/SyncE, Time Source

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NTP-related efforts

- The NTP Project
- Ntimed Project
- Works with the Khronos Project

Adding PTP refclock sources to `ntpd`
Upcoming DDoS detection/mitigation capabilities

Supporting Consortia: NTP, Time Source

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PTP-related efforts

Linuxptp-4 upcoming release (Richard Cochran, PM)

Libptpmgmt (Erez Geva, PM): Communicate with IEEE 1588 PTP clocks, using standard management TLVs

Exploring the use of Khronos with PTP

Supporting Consortia: PTP/SyncE

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SyncE-related efforts

NTF is hosting several SyncE projects.
(Different strokes for different folks)

Renesas: (Alexandru Mihut, PM)
SyncMonk: (Vipin Sharma, PM)
Intel: (in process)

Supporting Consortia: PTP/SyncE

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GTSAPI Project

I've been dealing with timestamps for a Long Time.
I've come to the conclusion they are often at best useful when used "soon", on the local system.
The tighter the requirements, the less useful traditional timestamps are.
Many things (eg, databases) require monotonic time.

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Timestamps and GTSAPI

System time might be applying a correction.
How far off is the system time from “ideal time”?
What are the error bounds on the system time?
What (version of what) timescale is being used?
When comparing two timestamps, did anything happen in between them that would affect the comparison?

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GTSAPI

To be generally useful, a timestamp needs:

- A clock discontinuity counter…
- So “time steps” can be tracked and accounted
- A “host ID”, to identify the system
- A “clock ID” identifies where the system got time
- Known offset between system and ideal time
- The timescale being used

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GTSAPI

- System time
- Expected/Maximun error
- Provable Signature
- Structure/API Version number, Flags
- Wide variety of kernels supported
- Library Support (conversion, comparison, arithmetic)
- Application support (NTP, SQL, etc.)

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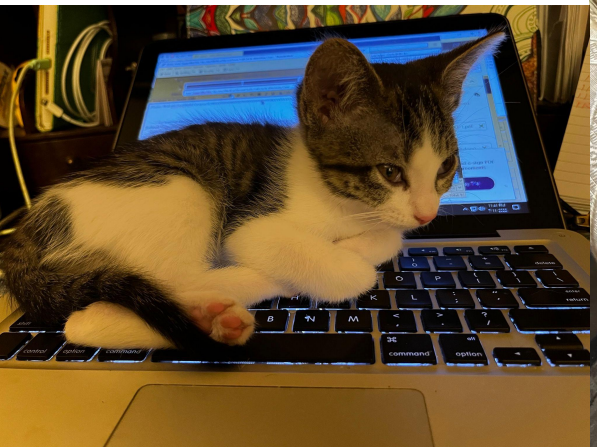
4 of 19 Helpers



Network Time Foundation

- A place where folks who care a lot about all things related to Network Time do good things.
- Hmmm
- BoF Session on Friday from 21:00-22:00, Ballroom A
- Table 219 @ exhibitor's room. Mediocre swag!
- info@nwtime.org
- stenn@nwtime.org