iputils project

Petr Vorel, SUSE Linux

About myself

Petr Vorel

- SUSE employee since 2016 (Linux kernel testing)
- LTP and iputils upstream developer
- Contributor to various open source projects (including Linux kernel) since 2012

Survey

Who has used?
- `ping`
- `arping`
- `tracepath`
- `clockdiff`

iputils history
Alexey Kuznetsov (1999–2002, 22 releases)

- iputils project founder, first maintainer, former Linux kernel network and iproute2 upstream developer
- First release Jan 1999 `iputils-ss990107.tar.gz` (sources lost)
- First downloadable release Apr 1999 `iputils-ss990417.tar.gz`
- Latest release Sep 2002 `iputils-ss020927.tar.gz`
- Unreleased Nov 2002 `iputils-ss021109-try.tar.bz2`
- Code author: `arping`, `tracepath`, `tracepath6`
- Ported BSD sources to Linux: `clockdiff`, `ping`, `ping6`, `rdisc`, `traceroute6`
- `netdev@vger.kernel.org` mailing list

iputils history

Hideaki Yoshifuji (2006–2015, 17 releases)

- 2nd iputils maintainer, former Linux kernel network upstream developer – IPv6
- First release Apr 2006 `iputils-s20060425.tar.bz2`
- Latest release on sourceforge.net Dec 2012 `iputils-s20121221.tar.bz2`
- Latest release Dec 2015 `iputils-s20151218.tar.bz2` (not on sourceforge.net, probably not widely adopted)
- Huge development
- IPv6 support
- uClibc libc support
- Started to use git (sourceforge.net and self hosting)
- `netdev@vger.kernel.org` mailing list

iputils on github

- David Heidelberg (2014–2018, 7 releases)
    - Founder of iputils fork on github (announced Apr 2014 on netdev ML)
    - 3rd iputils maintainer
    - First release s20140419
    - Last release s20180629
    - Upstream patches from linux distributions
    - License cleanup
    - musl libc support
    - Build tests on Travis CI
- Jan Synáček (2012–2019, mostly ping bugfixes)
- Pavel Šimerda (2015–2016, ping improvements)
    - 9fd870a ("ping: handle single protocol systems")
    - ebad35f ("ping: merge `ping6` command into `ping`")
    - 37953bf ("make `getaddrinfo()` and `getnameinfo()` usage consistent")

iputils on github

- Sami Kerola (2017–2021, 2 releases)
  - 4rd iputils maintainer
  - First release s20190324
  - Last release s20190515
  - Improve and modernize the code, bug fixes
  - meson build system
  - Time struct improvements
- Noah Meyerhans (since 2014, Debian iputils maintainer since 2001)
- Yuri Chornoivan (since 2020)
  - Localization on Fedora Weblate (now 12 languages)
- Petr Vorel (since 2017, 8 releases, the current iputils maintainer)
- Many other contributors ($\sim$ 138 contributors in git history, including Linux kernel network developers)

Current tools

- `ping` – send ICMP ECHO_REQUEST to a to network host
- `arping` – send ARP REQUEST to a neighbour host
- `tracepath` – traces path to a network host discovering MTU along this path
- `clockdiff` – measure clock difference between hosts

ping – send ICMP ECHO_REQUEST to a network host

BSD-3-Clause

- Author: Mike Muuss (U. S. Army Ballistic Research Lab.)
- Code originated from 1983
- Most important iputils tool
- SOCK_DGRAM (ICMP datagram socket), SOCK_RAW (raw socket – non-root user only with capability or setuid)

```
1 $ ping -c2 suse.com
2 PING suse.com (65.9.95.109) 56(84) bytes of data.
3 64 bytes from server-65-9-95-109.prg50.r.cloudfront.net (65.9.95.109):
      icmp_seq=1 ttl=243 time=15.0 ms
4 64 bytes from server-65-9-95-109.prg50.r.cloudfront.net (65.9.95.109):
      icmp_seq=2 ttl=243 time=11.0 ms
5
6 --- suse.com ping statistics ---
7 2 packets transmitted, 2 received, 0% packet loss, time 1002ms
8 rtt min/avg/max/mdev = 10.999/12.995/14.991/1.996 ms
```

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arping – send ARP REQUEST to a neighbour host

GPL-2.0-or-later

- Alexey Kuznetsov, later modified by YOSHIFUJI Hideaki (more options)
- IPv4 only (for IPv6 use `ndisc6`)

```
$ arping -c2 192.168.1.1
ARPING 192.168.10.1 from 192.168.10.133 eth0
Unicast reply from 192.168.10.1 [00:B0:D0:63:C2:26]  1.602ms
Unicast reply from 192.168.10.1 [00:B0:D0:63:C2:26]  1.766ms
Sent 2 probes (1 broadcast(s))
Received 2 response(s)
```

tracepath – traces path to a network host discovering MTU along this path

GPL-2.0-or-later

- Alexey Kuznetsov, later modified by YOSHIFUJI Hideaki (more options)

```
1 $ tracepath suse.com
2  1?: [LOCALHOST]                        pmtu 1500
3  1:  _gateway                                              1.285ms
4  ...
5  5:  185.243.124.9                                        35.055ms
6  6:  netx1.sferianet.cz                                   16.661ms
7  7:  cust-sferia-net.superhosting.cz                      18.282ms
8  ...
9 12:  be2318.ccr32.bio02.atlas.cogentco.com                49.998ms asymm 13
10 ...
11 30:  no reply
12       Too many hops: pmtu 1500
13       Resume: pmtu 1500
```

clockdiff – measure clock difference between hosts

BSD-3-Clause

- 1985, unknown author
- IPv4 only

```
1 # clockdiff 192.168.10.1
2 ................................................
3 host=192.168.10.1 rtt=8(16)ms/1ms delta=81202ms/81201ms Tue Jan 11
    20:47:08 2024
```

Removed tools (2021)

Tool	Removed	Last release	Replacement
ninfod	8f0d897	20211215	experimental unused protocol
rarpd	fba7b62	20211215	superseded by DHCP protocol
rdisc	7447806	20211215	superseded by DHCP protocol
tftpd	341975a	20210722	tftp-hpa, dnsmasq
traceroute6	a139421	20210722	mtr, traceroute, tracepath

Other projects

- `fping` – enhanced ping :)
  - Ping any number of targets
  - Output is designed to be easy to parse (scripts)
  - Output is minimal by default (`example.com is alive`), use `-l`, `--loop` for `ping` like output
  - By default no reverse-DNS lookup, can be forced (`-n, --name` – IP address only, `-d, --rdns` – also for hostnames)
  - Options incompatible with `ping`
  - Use also long options
- `mtr` – ping + traceroute
  - ncurses, GUI
  - `SOCK_DGRAM`, `SOCK_RAW`
  - Also for FreeBSD

Other projects

- BusyBox – low resources implementation (embedded)
  - Partly compatible (only some functionality implemented)
  - Requires root (no capability or setuid)
  - arping
  - ping (SOCK_RAW only)
  - traceroute
- inetutils (GNU)
  - ping – no dual stack in a single binary (ping IPv4 only, ping6 IPv6 only)
  - traceroute
  - Not much active development nowadays

Future

- Rewritte (modern C, fix design)
- All but `ping` is neglected
- Remove `clockdiff`, `tracepath`?
- Reviewers, network developers wanted
- Tests
- JSON output
- Color output
- Long options

Questions

Thank you!

Links

- Current iputils upstream
  `https://github.com/iputils/iputils`
- fping
  `https://fping.org/`
- mtr
  `https://www.bitwizard.nl/mtr/`
- BusyBox
  `https://busybox.net/`
- inetutils
  `https://www.gnu.org/software/inetutils/`
- Hideaki Yoshifuji's iputils releases (2006–2015)
  `http://www.skbuff.net/iputils/`
- Alexey Kuznetsov's iputils releases (1999–2002)
  `https://ftp.icm.edu.pl/packages/linux-iproute/ip-routing/`