Transmission’s PCP integration

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Transmission's port forwarding

- Open-source multiplatform BitTorrent client
- Transmission's port forwarding protocol support:
  - NATPMP - by libnatpmp
  - UPnP - by libminiupnpc
- Goal: Add PCP support
  - create port forwarding by PCP MAP operation
  - provide external port to application
  - use libpcp for PCP client implementation

Transmission's PCP integration

- Things making the integration easier:
    - port forwarding is already implemented in the app
    - existence of functions to enable/disable port forwarding, to change internal port and to handle change of external port
- Challenges:
    - Both libnatpmp and libminiupnpc provide simple API where application calls pulse function in predefined intervals to check for received response
        - 1/3 s while creating/deleting the mapping
        - 20 minutes afterwards to renew mapping
    - libpcp provides next timeout and file descriptors to check for input
    - Transmission uses libevent for FD and timer events
        - one event used for one FD
        - libpcp provides function returning fdset

Transmission’s PCP integration

- New libpcp API functions:
  - int pcp_set_fd_change_cb(pcp_fd_change_cb_t cb, void* cb_arg);
    - typedef void (*pcp_fd_change_cb_t) (int fd, int added, void *cb_arg, void ** fd_data);
  - int pcp_handle_fd_event(int fd, int timed_out, struct timeval *next_timeout);
  - pcp_pulse(struct timeval * next_pulse);

Transmission’s PCP integration

- Detailed description of libpcp integration:
    - library source code added into third-party/libpcp directory
    - new configure option --enable-external-pcp (use system installed libpcp)
    - new files
        - libtransmission/pcp_local.h – pcp layer interface for port-forwarding.c
        - libtransmission/pcp.c – pcp layer glue code
    - modified libtransmission/port-forwarding.c:
        - use PCP layer together with NATPMP and UPnP
        - call tr_pcpGetTimeout for PCP in event timer setting function instead of pulsing – use the smallest one.

Transmission's PCP integration

- Header file libtransmission/pcp_local.h:

```
#ifndef __TRANSMISSION__
#error only libtransmission should #include this header.
#endif

#ifndef PCP_LOCAL_H_
#define PCP_LOCAL_H_

typedef struct tr_pcp tr_pcp;

tr_pcp* tr_pcpInit (tr_session * session);

void tr_pcpClose (tr_pcp * pcp);

int tr_pcpPulse(struct tr_pcp * pcp, tr_port private_port, bool is_enabled,
        tr_port * public_port);

void tr_pcpGetTimeout(struct tr_pcp *pcp, struct timeval* timeout);

#endif /* PCP_LOCAL_H_ */
```

Transmission’s PCP integration

- PCP glue file libtransmission/pcp.c:
  - tr_pcpInit
    - called at application startup
    - uses PCP server provided by app configuration or auto discovery (trying all gateways)
    - set libpcp’s logger and fd_change callback functions
  - tr_pcpClose
    - close mapping
    - release used memory
  - tr_on_PCP_FD_change callback function
    - called from libpcp whe socket is opened or closed
    - create or delete libevent’s event associated with provided FD
  - tr_on_event callback function
    - called from libevent when data are ready to read on PCP sockets
    - call libpcp pcp_handle_fd_event function
  - tr_pcpPulse
    - called when port-forwarding’s timer times out or when application changes a port-forwarding state (enable/disable, change of internal port)
    - check state change and provide the info to libpcp
    - call pcp_pulse because of timing out of the timer
    - check mapping state and return it to caller
    - store returned timeout value

Transmission's PCP integration

- Source code download
  - Get Transmission source code for version 2.80 http://download.transmissionbt.com/files/transmission-2.80.tar.xz
  - Download and apply patch available as attachment for Transmission's ticket 5415 or download directly from url: https://trac.transmissionbt.com/attachment/ticket/5415/transmission_pcp.patch.gz
  - Integration of PCP patch is planned into Transmission version 2.90
- Transmission build instructions:
  - Transmission depends on openssl, libcurl and libevent packages. Install them before compiling.

```
$ ./autogen.sh
```

  - or optionally (to use system installed pcp lib instead of bundled one)

```
$ ./autogen.sh --enable-external-pcp
```

  - for more options run ./configure --help
  - Call make to build Transmission executables

```
$ make
```

Transmission sample output

```
$ cli/transmission-cli -s 100.2.0.1  http://releases.ubuntu.com/13.04/ubuntu-13.04-desktop-amd64.iso.torrent >/dev/null
[05:32:21.466] Transmission 2.77+ (14095) started
[05:32:21.467] RPC Server: Adding address to whitelist: 127.0.0.1
[05:32:21.480] DHT: Generating new id
[05:32:21.800] Port Forwarding (PCP): Added PCP server 100.2.0.1
[05:32:21.800] Port Forwarding (PCP): Added new flow info:
                    PCP server: ::ffff:100.2.0.1
                    Int.  addr: [::ffff:10.20.40.2]:51413
                    Dest. addr: [::]:0
                    Key bucket: 160
[05:32:21.800] Port Forwarding (PCP): Pinging PCP server at address 100.2.0.1
[05:32:21.800] Port Forwarding (PCP): Sent PCP MSG (flow bucket:160)
[05:32:21.800] Port Forwarding (NAT-PMP): initnatpmp succeeded (0)
[05:32:21.800] Port Forwarding (NAT-PMP): sendpublicaddressrequest succeeded (2)
[05:32:29.808] Port Forwarding: State changed from "Not forwarded" to "Starting"
[05:32:29.808] Port Forwarding (PCP): Received PCP packet from server at 100.2.0.1, size 60, result_code 1, epoch 0
[05:32:29.808] Port Forwarding (PCP): Version 2 not supported by server 100.2.0.1. Trying version 1.
[05:32:29.808] Port Forwarding (PCP): Sent PCP MSG (flow bucket:160)
[05:32:29.809] Port Forwarding (PCP): Received PCP packet from server at 100.2.0.1, size 48, result_code 0, epoch 4350642
[05:32:29.809] Port Forwarding (PCP): Found matching flow 160 to received PCP message.
[05:32:29.809] Port Forwarding: State changed from "Starting" to "Forwarded"
[05:32:30.538] Saved "/home/ptatrai/.config/transmission/torrents/ubuntu-13.04-desktop-amd64.iso.f41989f9797a8850.torrent"
[05:32:31.775] ubuntu-13.04-desktop-amd64.iso: Could not connect to tracker
[05:32:31.775] ubuntu-13.04-desktop-amd64.iso: Retrying announce in 307 seconds.
^C[05:32:35.438] ubuntu-13.04-desktop-amd64.iso: Pausing
[05:32:35.439] Saved "/home/ptatrai/.config/transmission/resume/ubuntu-13.04-desktop-amd64.iso.f41989f9797a8850.resume"
[05:32:35.439] Saved "/home/ptatrai/.config/transmission/settings.json"
[05:32:35.439] DHT: Not saving nodes, DHT not ready
[05:32:35.439] Port Forwarding: Stopped
[05:32:35.439] Port Forwarding (PCP): Sent PCP MSG (flow bucket:160)
[05:32:35.439] Port Forwarding: State changed from "Forwarded" to "Not forwarded"
[05:32:35.439] Port Forwarding (PCP): PCP server 100.2.0.1 terminated.
[05:32:35.439] ubuntu-13.04-desktop-amd64.iso: Removing torrent
[05:32:35.439] ubuntu-13.04-desktop-amd64.iso: Pausing
```

Transmission demo

Transmission with PCP support

Thank you.

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