Universal Plug and Play (UPnP) Internet Gateway Device (IGD)-Port Control Protocol (PCP) Interworking Function

draft-bpw-pcp-upnp-igd-interworking-02
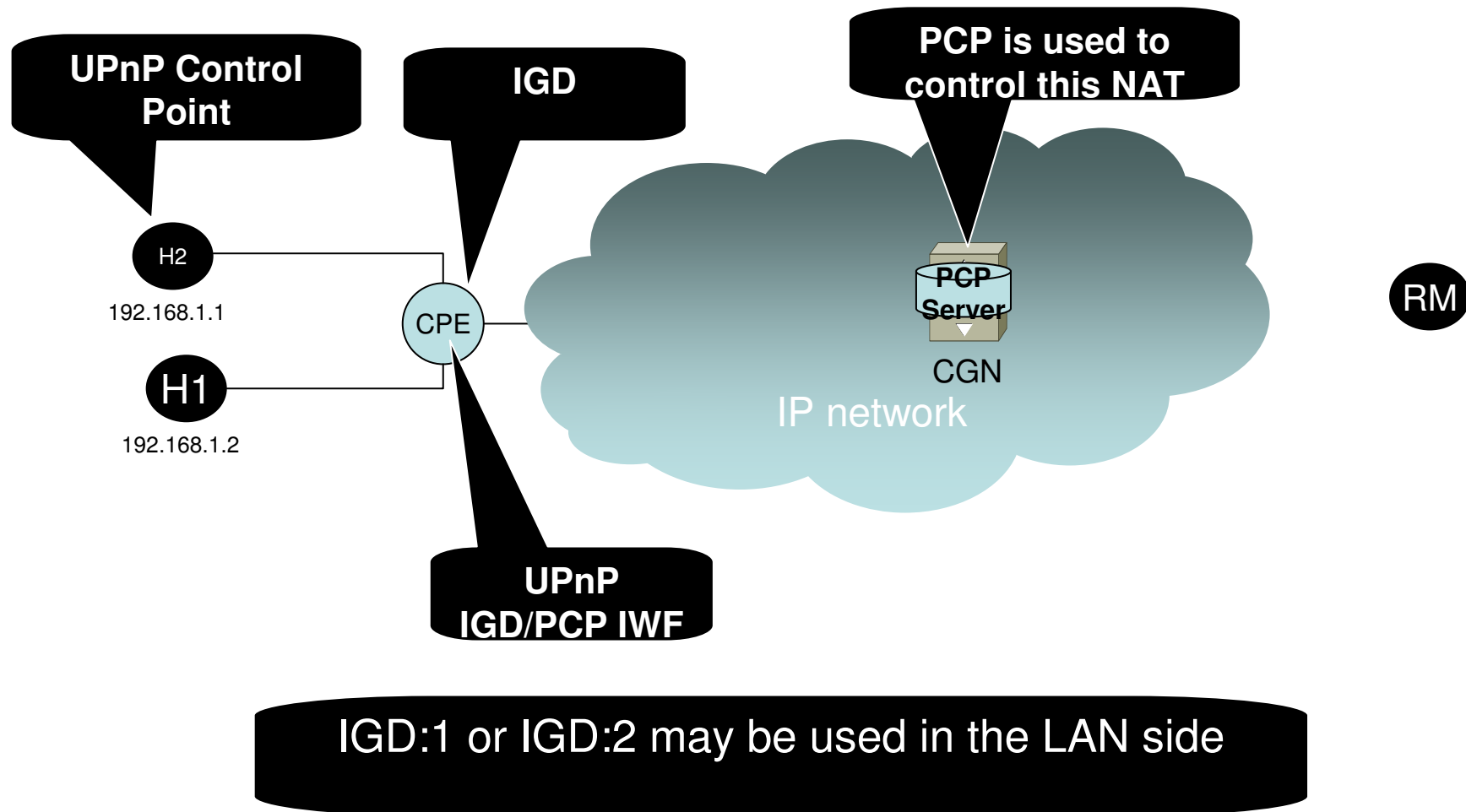
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Agenda

- Architecture Model
- Rationale
- Open questions
- First experiment results

Architecture Model

UPnP IGD-PCP IWF: Rationale

- IWF: Variables, Methods and Errors
- Control of a local firewall is not managed by the IWF but a means to control it is required
- Both the cases where a NAT is co-located or not with the IWF are covered
- When AddPortMapping() is used, a PREFER_FAILURE option is included in the PCP request
  - The IWF checks first if the requested port is in use locally or not
- No PREFER_FAILURE option is inserted in the corresponding PCP message when AddAnyPortMapping() is received for the UPnP CP
- A Local Mapping Table is maintained by the IWF
- When GetExternalIPAddress is received, a corresponding MAP4 is generated by the IWF with a short lifetime

Some IGD:1 Implementations Behaviour

Microtorrent (uTorrent) v2.2	Calls GetSpecificPortMapping until it finds an external available port, and then calls AddPortMapping()
Azureus v4.6.0.2	Calls AddPortMapping, after it finds the external port is not available, then it tries the same port 5 more times by calling AddPortMapping, then it returns an error
Emule v0.50a	Calls AddPortMapping, after it finds the external port is not available, then it returns an error

Open Question # 1

- To list active mappings, an UPnP Control Point may issue GetGenericPortMappingEntry(), GetSpecificPortMappingEntry() or GetListOfPortMappings()

- In the current version of the I-D, these methods are not relayed to the PCP Server but are handled according to the content of the local mapping table
  - The answer may not be accurate since the IWF has only a local knowledge of the global mapping table
  - Some applications issue first Get* to check whether a port is in use or not before sending Add*
  - Open question: Do we allow relaying Get* to PCP MAP4?
    - No such method is currently defined in the base PCP
    - GET is only an extension
      - GET is defined in I-D.boucadair-pcp-failure

Open Question #2

- When DeletePortMappingRange() is used
  - The IGD-PCP IWF undertakes a lookup on its local mapping table to retrieve individual mappings instantiated by the requested Control Point and matching the signalled port range
  - If no mapping is found, "730 PortMappingNotFound" error code is sent to the UPnP Control Point
  - If a set of mappings are found, the IGD-PCP IWF generates individual PCP MAP4 delete requests corresponding to these mappings
- Question (optimization)
  - Do we allow the IWF to send a positive answer to the requesting UPnP Control Point without waiting to receive all answers from the PCP Server?
    - It is unlikely to encounter a problem in the PCP leg because the IWF has verified authorization rights and also the presence of the mapping in the local table

Open Question #3

- In case of loss of synchronization (reboot, power outage), the IWF sync its state with the PCP Server using GET/NEXT
  - Per-subscriber quota may be exhausted due to stale mappings

- Question
  - This procedure focuses on the scenario where no PCP Client is in the LAN side
    - Things may be complex when there are PCP Proxy/IWFs
  - GET/NEXT is not defined in the base PCP
    - GET/NEXT is defined in I-D.boucdair-pcp-failure
   - What to do with that I-D?

Open Question #4

- Scenario
  - UPnP Control Point creates a mapping with a 5 day lifetime
  - IWF creates the corresponding pinhole with one day lifetime, schedules a renewal each 24 hours and returns success
  - Two days after the renewal fails

- What to do?
  - State this is a rare failure case and we can do nothing?
  - Else?

Testing Activities: First Results (Conducted by X. Deng)

- UPnP-PCP interworking function (based on -05, working on an update to be compatible with -07)
  - Plain IPv6 mode is used
- PCP server: Embedded with "Vendor A" DS-Lite AFTR
- UPnP-PCP IWF: based on OpenWrt OS and customized to support DS-Lite B4
- UPnP Client: utorrent, Emule, Bitcomet, Azureus v4.6.0.2, Shareazav2.5.4
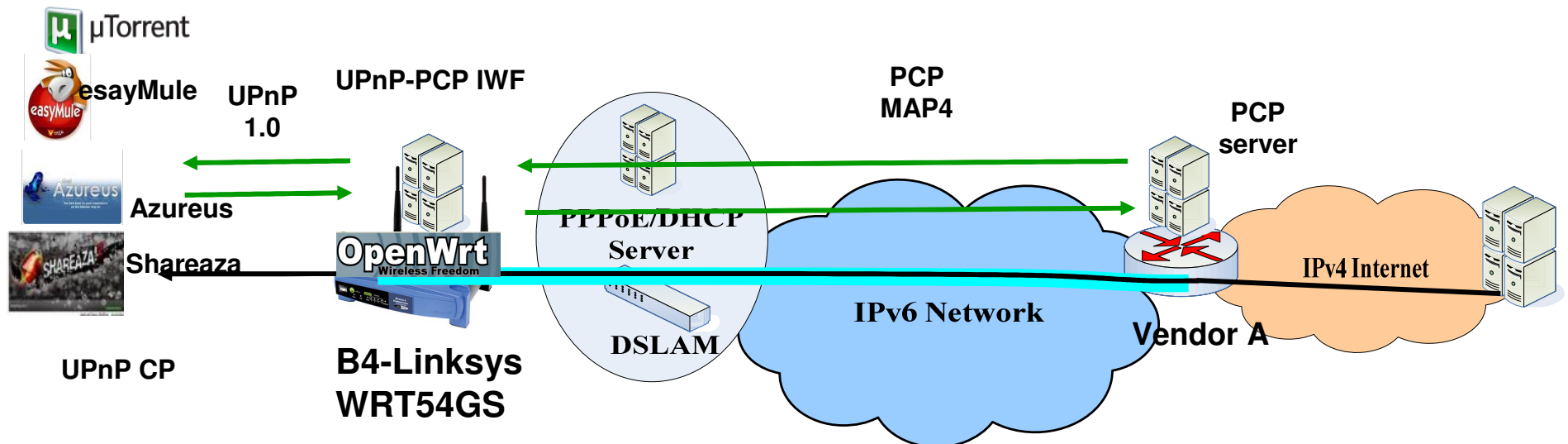
Testing Activities: First Results

- Add a pinhole
  - PCP-UPnP IWF transmits the request of the UPnP CP to the PCP Server, returns the result to the CP and updates the IWF mapping list
- Delete a pinhole
  - PCP-UPnP IWF transmits the request of UPnP CP to PCP Server, returns the result to CP and updates the IWF mapping list
- Get CPE's list of instructed mappings
  - On reboot, PCP-UPnP IWF acquires all instructed mappings related to the CPE by GET/GETNEXT requests from PCP server and update PCP proxy mapping list
- Refresh PCP pinhole according to lifetime
  - PCP-UPnP IWF, check lifetimes in mapping list and refresh specific PCP pinhole on PCP server
- Supported PCP Options
  - PREFER_FAILURE Option
  - Description PCP Option to associate a text with a PCP pinhole
  - Check whether the PCP Server is able to preserve port parity
- Misc
  - Check the PCP Server holds the external IP and port pair of a deleted port mapping for 120 seconds