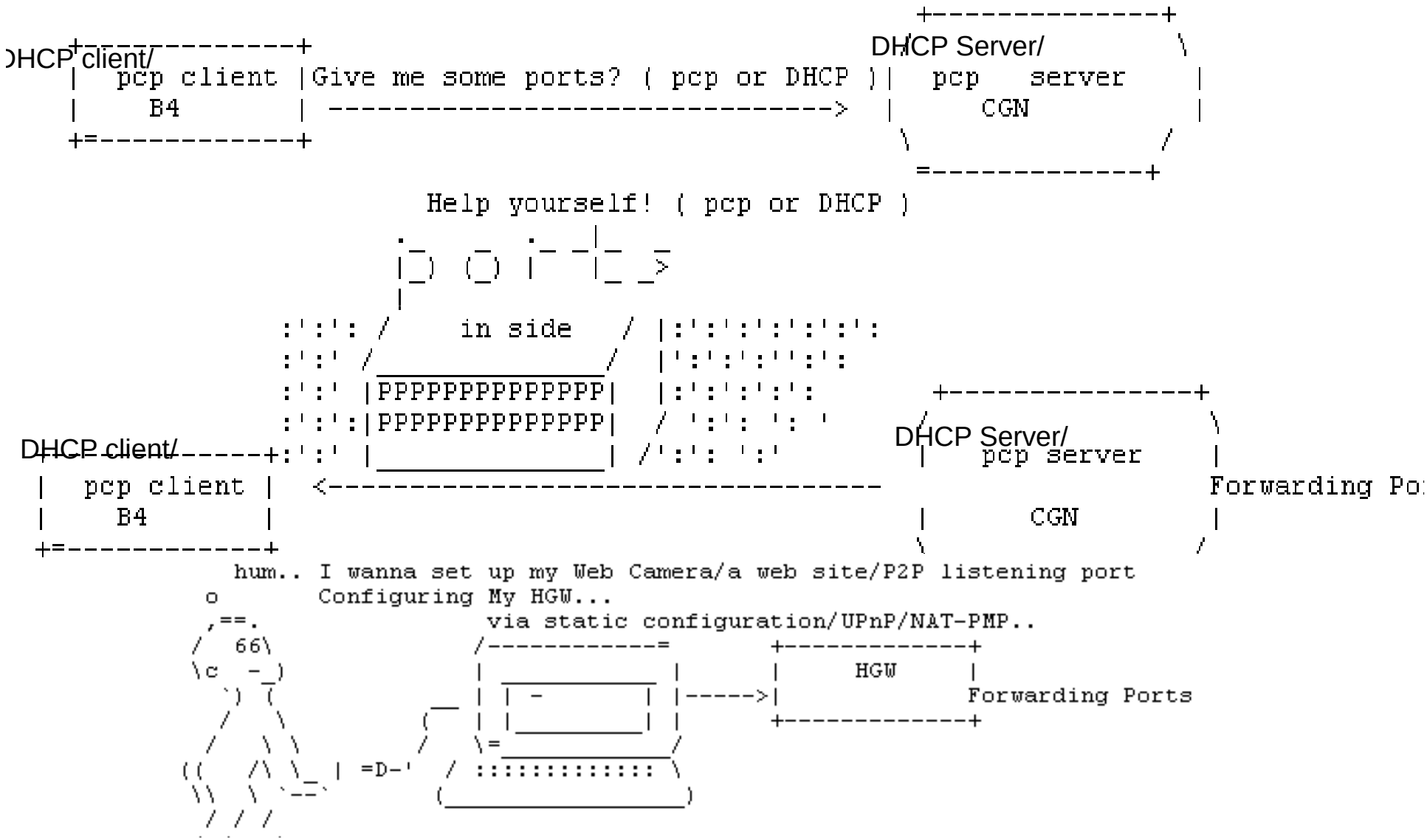
NAT offload extension to Dual-Stack lite

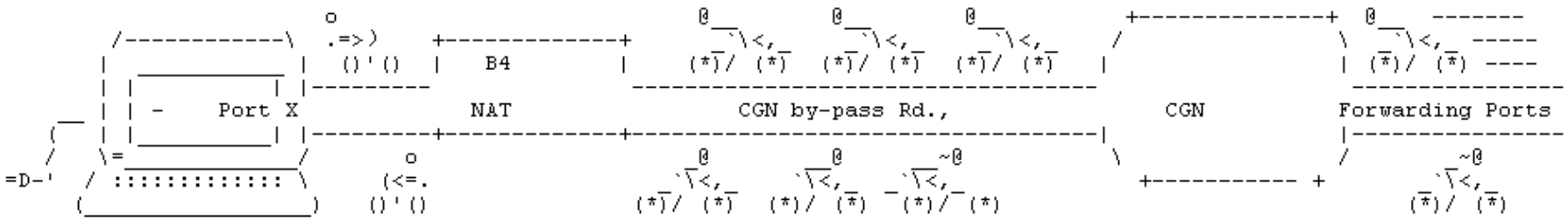
X. Deng, M. Boucadair
France Telecom
C. Zhou Huawei Technologies
T. Tsou Huawei Technologies (USA)
G. Bajko Nokia

IETF 82, Taipei

Core idea


DHCP client/
pcp client
B4
Give me some ports? (pcp or DHCP)
DHCP Server/
pcp server
CGN
Help yourself! (pcp or DHCP)
in side
DHCP client/
pcp client
B4
DHCP Server/
pcp server
CGN
Forwarding Po
hum.. I wanna set up my Web Camera/a web site/P2P listening port
Configuring My HGW...
via static configuration/UPnP/NAT-PMP..
HGW
Forwarding Ports

How it works



- Outbound Session
  - B4 behaviors
    - NAT & Encapsulation
  - AFTR behaviors
    - De-capsulation & forward
- Inbound Session
  - AFTR behaviors
    - Encapsulation & port forwarding
  - B4 behaviors
    - De-capsulation & NAT

Port Set

- Continuous Port Range
- Non-Continous/Scattered Port Sets

Scattered ports provisioning

- What's the benefits of provisioning scattered ports?
  - For incoming ports
  - Scattered ports allocation is more likely to satisfy the random incoming port requests from applications
    - such as eMule, uTorrent,sharez, using UPnP 1.0

- A solution
  - to distribute bulks of non-continuous ports among subscribers,
  - also takes port randomization into account

How to provision scattered ports?

- Only two parameters
- Subscribers ID pattern

1st	2nd	3rd	4th	5th	6th	7th	8th
0	s	0	0	s	0	s	0

9th	10th	11th	12th	13th	14th	15th	16th
s	0	s	0	0	0	0	0

- Subscribers ID value

1st	2nd	3rd	4th	5th	6th	7th	8th
1	**0**	1	1	**0**	1	**0**	1

9th	10th	11th	12th	13th	14th	15th	16th
0	1	**1**	1	1	1	1	1

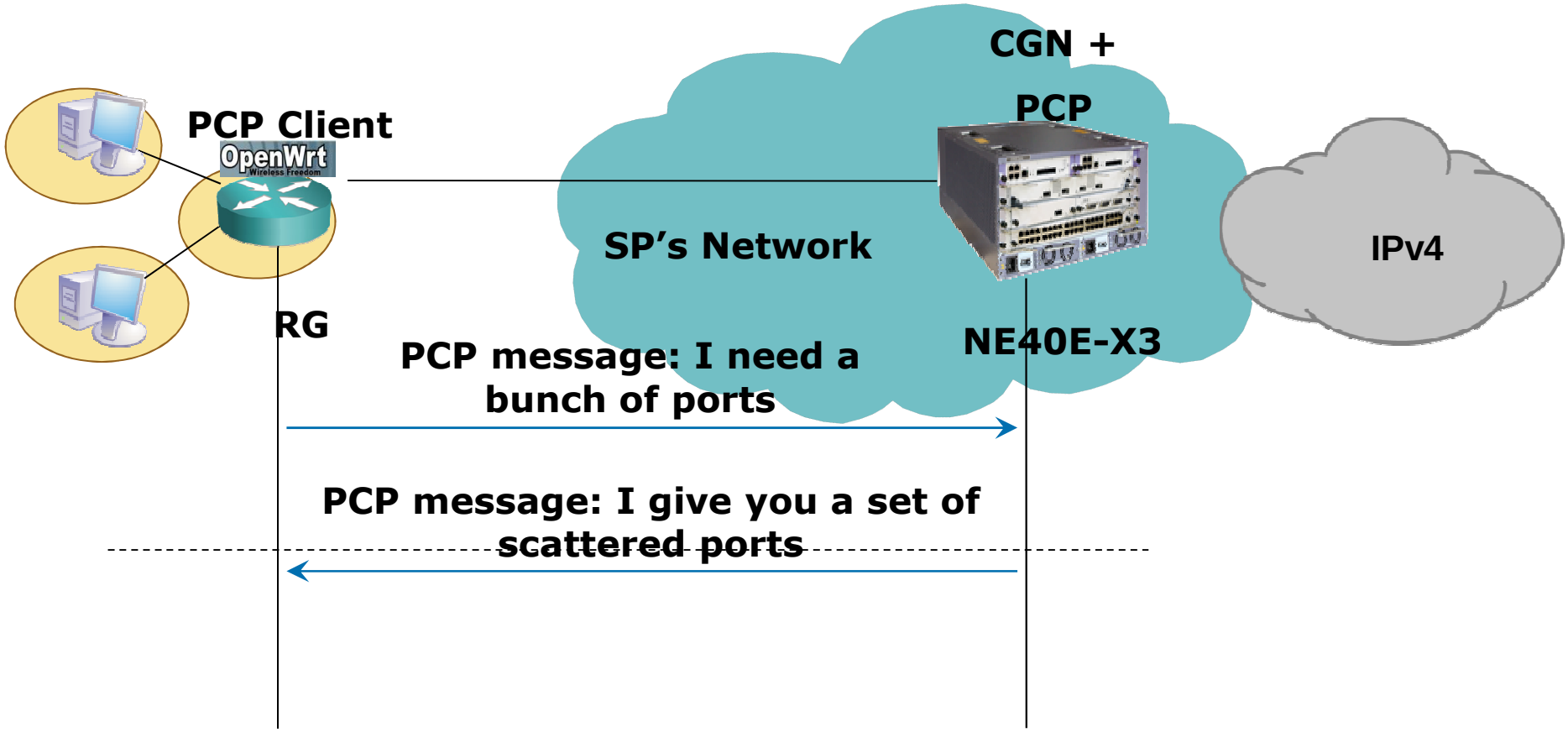
Random ephemeral port selection within the restricted port for CPE NAT

- Subscribers ID pattern
- Subscribers ID value

Only one line code needs to be changed!

```
do{
    restricted_next_ephemeral = (random()|subscriber_ID_pattern)
                                & subscriber_ID_value;
    if(five-tuple is unique)
    return restricted_next_ephemeral;
}
```

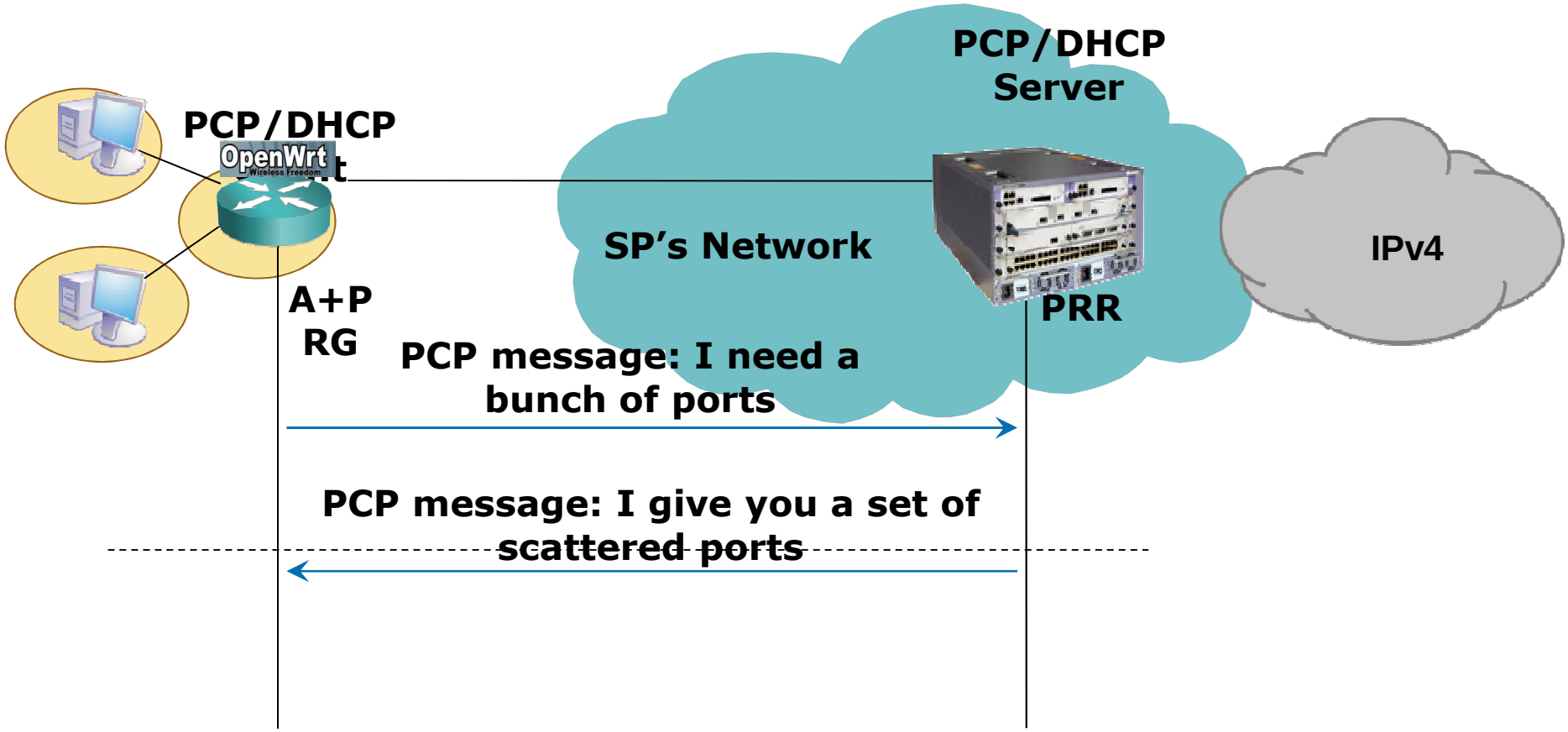
An Implementation
DS-Lite encapsulation (demonstrated)



Location: **2000D**

Check out website for this demo: http://130.129.48.23:35328/

Alternative implementation
A+P encapsulation



Updates/action items from Softwires Interim meeting

- **Restricted port allocation strategies**
- **Merging with draft-cui-softwire-b4-translated-ds-lite**

Restricted port allocation strategies

- Either per port on demand
- Or pre-allocating an exclusive port set
- Trade-off : provisioning efficiency vs. IPv4 sharing ratio efficiency.
- Efficiency log
  - e.g.,one log entry per customer
  - reported by some operators as a practical/operational requirement for AFTR.
  - Feasible

Questions for WG

- Non-consensus between to-be merged two drafts
- Scope?
  - **draft-zhou-softwire-b4-nat**
    - Extension to DS-lite
  - **draft-cui-softwire-b4-translated-ds-lite**
    - Per-user state IPv4-over-IPv6
- Terms?
  - **draft-zhou-softwire-b4-nat**
    - NAT Offload Extension Dual-stack Lite
  - **draft-cui-softwire-b4-translated-ds-lite**
    - Lighweight 4over6