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NAT44 Translation Testing in Wuxi Branch of China Telecom
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Abstract

This document describes the testing result of CGN device in Wuxi Branch of China Telecom, by providing an overview of state about supporting applications to adapt to NAT by CGN. The CGN device is from Huawei and the test environment is real network in Wuxi China.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in .

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on January 10, 2013.

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1. Introduction

This testing is based on specification of IP device from China Telecom. The main purpose is to know the states that CGN supports the applications translating the NAT device. The testing is done on a real network of China Telecom Wuxi branch where the CGN is a centralized device for NAT translation.

Base on testing result we know which applications could adapt to the NAT device and the time delay after translation, whether there is echo for video and audio services.

The CGN devices include BRAS, SR, CR which can support NAT444 by adding a CGN board or connecting a CGN device. The access devices include LSW, DSLAM, OLT, MxU. CPE devices can be HGW, ONT which support router/bridge model. Other devices such as Network management servers, log servers, AAA servers, user action analysis server, FTP/HTTP server are also included in the system.

2. Terminology

This document makes use of the following terms:

NAT: Network Address Translation
CGN : Carrier Grade NAT
BRAS: Broadband Remote Access Server
SR: Service Router
CR: Core Router
LSW: LAN Switching
DSLAM: Digital Subscriber Line Access Multiplexer
OLT: Optical Line Terminal
CPE: Customer premises equipment
HGW: Home Gateway
ONT: Optical Network Terminal
FTP: File Transfer Protocol
HTTP: Hypertext Transfer Protocol
ALG: Application Layer Gateway
PCP: Port Control Protocol
VPN: Virtual Private Network
SSH: Secure Shell

3. Testbed Overview

3.1. A general topology for NAT444 testing

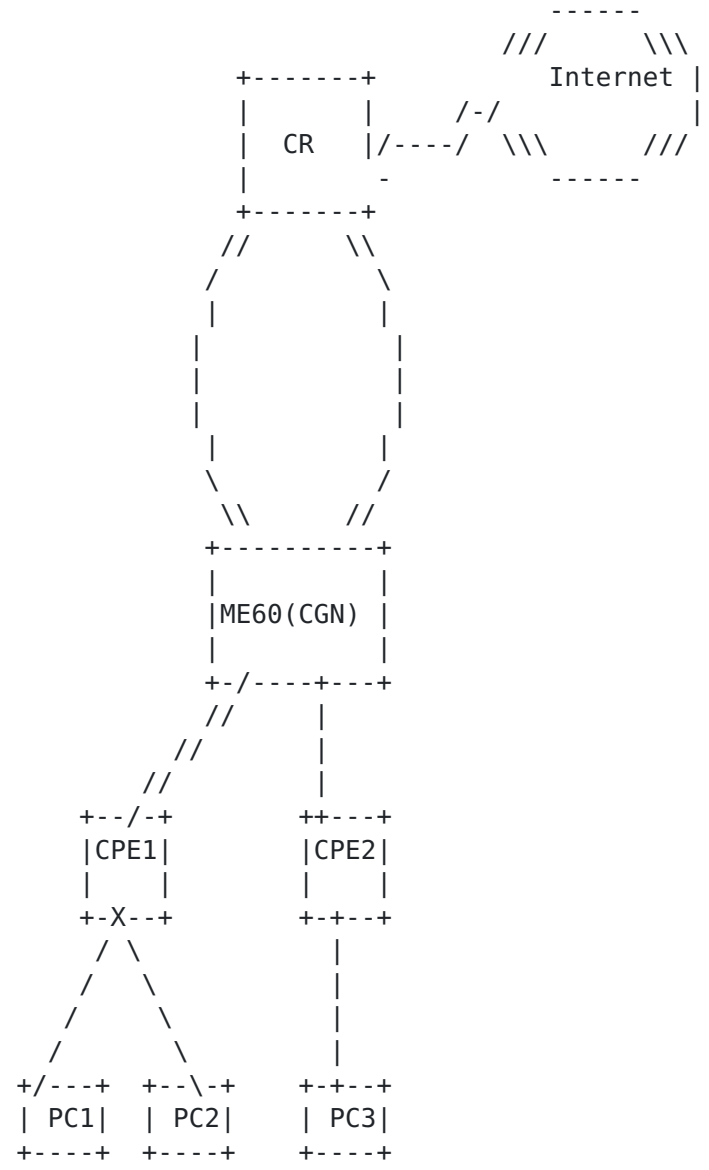

Figure 1: Distributed CGN topology for NAT444 testing

In figure 1 CPE1 and CPE2 have NAT function, and NE60 is a BRAS device with a embedded CGN . There are two scenarioes in figure 1. Scenario 1: Communication between PC1 and PC2; Scenario 2: Communication between PC2 and PC3 .

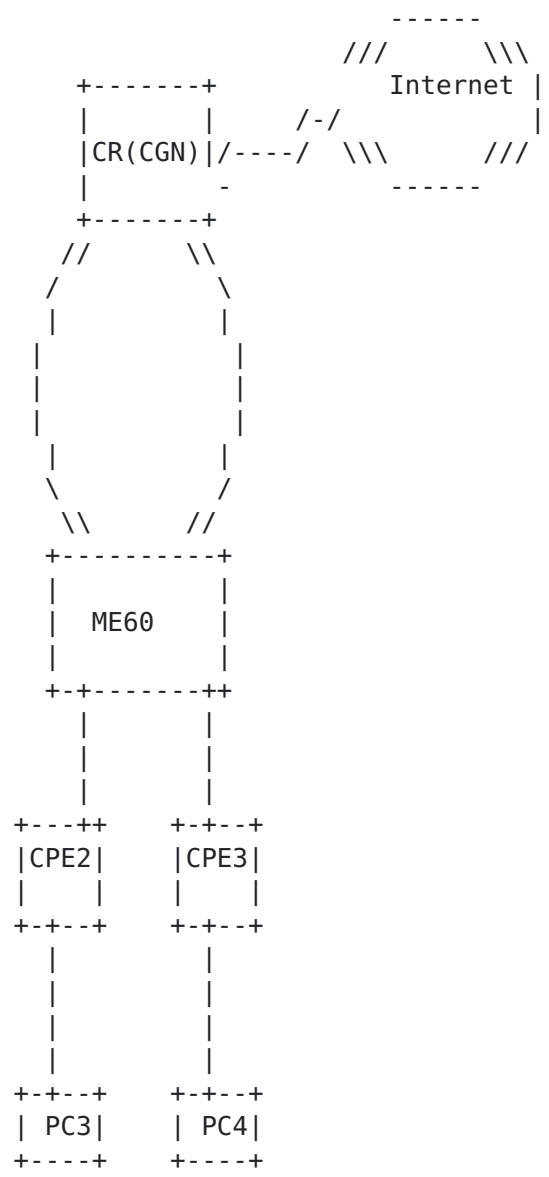

Figure 2:Centralized CGN topology for NAT444 testing

In figure 2 CPE2 and CPE3 have NAT function, and NE60 is a BRAS device without embedded CGN . There is an embedded CGN in CR device. This is scenario 3: Communication between PC3 and PC4.

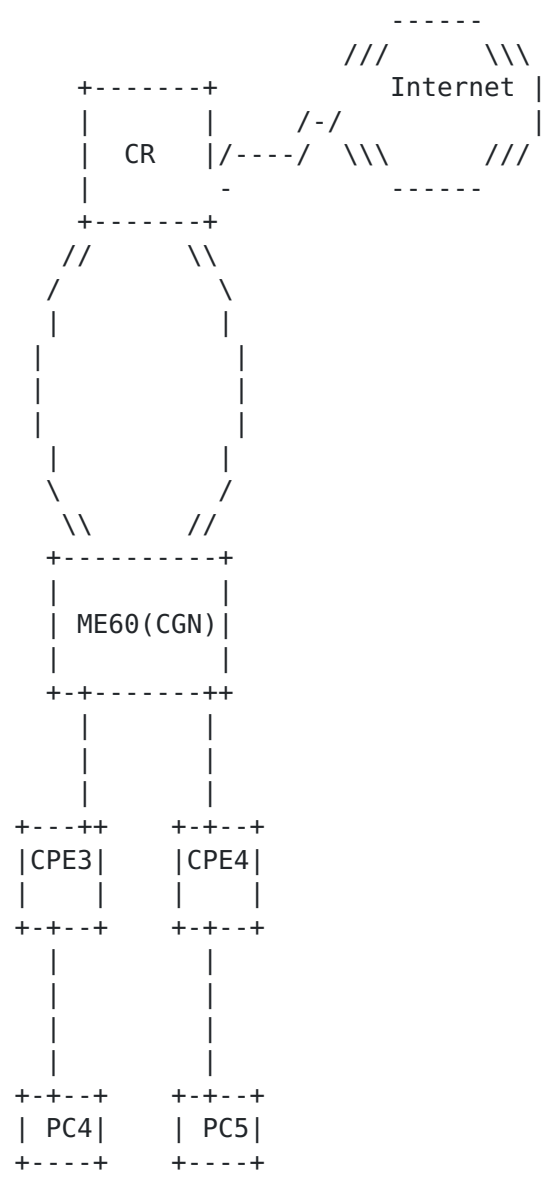

Figure 3:Public user and private user interworking

In figure 3 CPE3 has NAT function and accesses a private IP address from NE60; CPE4 has NAT function and accesses a public IPv4 address by PPP from NE60. NE60 is a BRAS device with a embedded CGN. This is scenario 4: Communication between PC4 and PC5.

3.2. Testbed Description

During the testing ALG function can be closed and open. So we tested based on: Activation ALG and three-tuple(Index NAT entries by source IP, source port, protocol) ; Deactivation ALG and tree-tuple;

Activation single ALG and three-tuple; Activation ALG and Five-tuple(Index NAT entries by source IP, source port, protocol, destined IP, destined port) ; Deactivation ALG and five-tuple;

4. Applications Testing Overview

This section describes testing result for all kinds applications.

4.1. Instant message applications

4.1.1. Microsoft Messenger

Test Item	IM
Sub-Item	Microsoft Messenger
Test Objective	Check whether Microsoft Messenger can work under NAT 44.Voice, Video, Webcam,File transfer are tested
Test Scenario	Scenario:1, 2,3,4
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install MSN in PC 3.Check whether MSN user can register 4.Check whether users can communicate normally 5.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	MSN user can register Two user can communicate with MSN Under four scenarios two user can communicate
Actual Result	Passed
Remarks	Independent ALG

4.1.2. skype

Test Item	IM
Sub-Item	Skype
Test Objective	Check whether skype can used under NA44. Voice, Video, Webcam, File transfer are tested
Test Scenario	Scenario:1, 2,3,4
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install skype in PC 3.Check whether skype user can register 4.Check whether users can communicate normally 5.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	Skype user can register Two user can communicate with skype Under four scenarios two user can communicate
Actual Result	Passed
Remarks	Independent ALG

4.1.3. Other IM

We tested other IM application in the same way and got the same result as MSN. Other IM application include Feixin, QQ, Miliao, aliwangwang, and they are all popular IM applications in china.

4.2. Web browsing

4.2.1. www.google.com

Test Item	Web browsing
Sub-Item	www.google.com
Test Objective	Check whether we can access www.google.com when there is NAT in the network.
Test Scenario	Scenario:1, 2,3,4 PCs can access web browsing
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Open browsing and access www.google.com in PC 3.Check whether PC can access the Web normally. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	PC can access the web.
Actual Result	Passed
Remarks	Independent ALG

4.2.2. Other web browsings

We tested other web browsings in the same way and got the same result as google web. Other web browsings include www.baidu.com, www.yahoo.com, www.sohu.com, www.renren.com, www.sina.com, www.tianya.cn, www.qq.com, www.163.com, www.ifeng.com, www.chinanews.com, and they are all popular web sites in china. We also access web by HTTPS,we access https://chatmodels.dmm.co.jp/login/top and it runs smoothly.

4.3. Online gaming

4.3.1. QQ online gaming

Test Item	Online gaming
Sub-Item	QQ Online gaming
Test Objective	Check whether PC can register QQ online gaming room.
Test Scenario	Scenario:1, 2,3,4 PCs can access online gaming room.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install QQ online gaming client on PC 3.Check whether PC can entry game room and play. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	QQ game user can entry game room and play.
Actual Result	Passed
Remarks	Independent ALG

4.3.2. Other online gaming

We tested other online gamings in the same way and got the same result as QQ online gaming. Other online gamings include World of Warcraft , QQ farm, ourgame, Kaixin network, and they are all popular online game in china.

4.4. Downloading

4.4.1. HTTP downloading

Test Item	Downloading
Sub-Item	HTTP downloading
Test Objective	Check whether PC can download by HTTP with NAT444 on the networks.
Test Scenario	Scenario:1, 2,3,4 PCs can download by HTTP.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Open any software or MP3 file download page. 3.Check whether PC can download the by HTTP. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can download files by HTTP.
Actual Result	Passed
Remarks	Independent ALG

4.4.2. FTP downloading

Test Item	Downloading
Sub-Item	FTP downloading
Test Objective	Check whether PC can download by FTP with NAT444 on the networks.
Test Scenario	Scenario:1, 2,3,4 PCs can download by FTP.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Input a FTP address:FTP://debian.bjlx.org.cn. 3.Check whether PC can connect to FTP server and download by FTP. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can download files by FTP.
Actual Result	Passed but dependent ALG
Remarks	Not testing when FTP server is in private network

4.4.3. Bittorrent/eMule downloading

Test Item	Downloading
Sub-Item	Bittorrent/eMule
Test Objective	Check whether PC can download by Bittorrent/eMule
Test Scenario	Scenario:1, 2,3,4 PCs can download by Bittorrent /eMule
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install Bittorrent or eMule client on PC. 3.Check whether PC can download by Bittorrent/eMule. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can download files by Bittorrent. User can download files by eMule.
Actual Result	Passed and Independent ALG
Remarks	No testing When Bittorrent server in private network No testing When eMule server in private network. CGN not support PCP

Remark: PCP([draft-ietf-pcp-base-26]) is not actived in CGN. When eMule/Bittorrent server is behind in CGN, we didn't test.

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4.4.4. Xunlei downloading

Test Item	Downloading
Sub-Item	Xunlei downloading
Test Objective	Check whether PC can download by Xunlei when it is in a private network.
Test Scenario	Scenario:1, 2,3,4 PCs can download by Xunlei.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install Xunlei client on PC. 3.Open a file in Xunlei and check whether PC can download by Xunlei. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can download files by Xunlei.
Actual Result	Passed and Independent ALG
Remarks	

4.5. Internet Video/music

4.5.1. PPStream

Test Item	Internet Video/music
Sub-Item	PPStream
Test Objective	Check whether PC with PPStream client can play video /music programme.
Test Scenario	Scenario:1, 2,3,4 PCs can play video/music programme
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install PPStream client on PC. 3.Check whether PC can play programmes on PPStream. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can see the film or listen to music with PPStream client.
Actual Result	Passed
Remarks	Independent ALG

4.5.2. Other Internet Video/music

We tested other Internet Video/music software in the same way and got the same result as PPStream. Other Internet Video/music software include PPlive, Youku, Qiyi, Xunleikankan, Tudou, Baidu video, Sohu video, 163 video, and they are all popular video/music used in china.

Youtube can't be accessed by Chinese user and do not pass the test.

4.6. Email

4.6.1. Outlook/Outlook express

Test Item	Email
Sub-Item	Outlook/Outlook express
Test Objective	Check whether PC with Outlook/Outlook express can receive and send mail from mail server.
Test Scenario	Scenario:1, 2,3,4 PCs can receive/send mail.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Set Outlook/Outlook express on PC. 3.Check whether PC can use Outlook/Outlook express. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can see the film or listen to music with PPStream client.
Actual Result	Passed
Remarks	Independent ALG

4.6.2. Other Email softwares

We tested other Email software in the same way and got the same result as Outlook/Outlook express. Other Email softwares include QQ mail, 163 mail, sina mail, and they are all popular mail used in china.

4.7. Other applications

4.7.1. Telnet

Test Item	Telnet
Sub-Item	Telnet
Test Objective	Check whether PC can telnet a device within NAT environment.
Test Scenario	Scenario:1, 2,3,4 PCs can Telnet.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Configure the Telnet on a PC. 3.Check whether PC can build telnet. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can build the telnet connection.
Actual Result	Passed
Remarks	Independent ALG

4.7.2. SSH

Test Item	SSH
Sub-Item	SSH
Test Objective	Check whether PC can build SSH connection within NAT environment.
Test Scenario	Scenario:1, 2,3,4 PCs can Build SSH connection.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Configure the SHH on a router in network 3.Check whether PC can build SSH connection 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can build the SHH connection.
Actual Result	Passed
Remarks	Independent ALG

4.7.3. Traceroute

Test Item	Traceroute
Sub-Item	Traceroute (using ICMP)
Test Objective	Check whether two PCs behind NAT can traceroute. NAT environment.
Test Scenario	Scenario:1, 2,3,4 .
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Traceroute from a PC to another PC. 3.Check whether two PC can traceroute. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	Two users can traceroute.
Actual Result	Passed
Remarks	Independent ALG

4.7.4. Remote desktop

Test Item	Remote desktop
Sub-Item	Remote desktop
Test Objective	Check whether a PC behind NAT can remote desktop to another PC behind NAT or to a public PC.
Test Scenario	Scenario:1, 2,3,4 .
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Remote desktop from a PC to another PC. 3.Check whether two PC can remotedesktop successfully 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User behind CGN can remote desktop to another CGN user or a public IP user.
Actual Result	Passed
Remarks	Independent ALG

4.8. VPN

4.8.1. iAccess

Test Item	VPN
Sub-Item	iAccess
Test Objective	Check whether a PC behind NAT can remote desktop to another PC behind NAT or to a public PC.
Test Scenario	Scenario:1, 2,3,4 .
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Get a iAccess user and password from company. 3.Check whether public PC can access the company. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can access company resource from public network by iAccess user and password.
Actual Result	Passed
Remarks	Independent ALG; not test PPTP,L2TP

4.9. Shopping online

4.9.1. Taobao

Test Item	Shopping online
Sub-Item	Taobao
Test Objective	Check whether user can shop by Taobao within NAT environment.
Test Scenario	Scenario:1, 2,3,4 PC can access Taobao. .
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Open browsing and input Taobao address. 3.Check whether user can access Taobao web site. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can shop in Taobao and do all kind of operation in web site.
Actual Result	Passed
Remarks	Independent ALG

4.10. Bank

4.10.1. China Merchants Bank

Test Item	Bank
Sub-Item	China Merchants Bank
Test Objective	Check whether user can use online bank web within NAT environment.
Test Scenario	Scenario:1, 2,3,4 PC can access online bank. .
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Open browsing and input China Merchants Bank Addr 3.Check whether user can use online bank. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can use online bank on web site.
Actual Result	Passed
Remarks	Independent ALG

4.11. Negotiable securities

4.11.1. United securities

Test Item	Negotiable securities
Sub-Item	United securities
Test Objective	Check whether user can entry securities exchange centre and trade.
Test Scenario	Scenario:1, 2,3,4 PC can access securities web.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install United securities client. 3.Check whether user can entry the securities exchange centre and trade 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can entry securities exchange centre and trade.
Actual Result	Passed
Remarks	Independent ALG

4.12. Map

4.12.1. google map

Test Item	MAP
Sub-Item	Google map
Test Objective	Check whether user can use google map for search Within the NAT environment.
Test Scenario	Scenario:1, 2,3,4 PC can use google map.
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Open google map. 3.Check whether user can goole map for search. Check the session entries on CGN. 4.Test Activation/Deactivation/Single ALG+tree-tuple
Expected Result	User can use google map for search.
Actual Result	Passed
Remarks	Independent ALG

We tested Baidu map in the same way and got the same result .

5. Applications Testing with same public IP address

This section describes testing result when different CPEs use same public IP address. The purpose of testing is make sure the application can also be used when different users use same external public IP address.

This section include three scenarios. Scenario 1: in figure 1 PC1 and PC2 use same external public IP address; Scenario 2: in figure1 PC2 and PC3 use same external public IP address; Scenario 3: in figure 3 PC4 are CGN user and PC5 are public user;

5.1. Instant message applications

5.1.1. Microsoft Messenger

Test Item	IM
Sub-Item	Microsoft Messenger
Test Objective	Check when ALG active or deactive whether MSN has same communication flow in three scenarios.
Test Scenario	Scenario:1, 2,3
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install MSN in PC 3.Check whether MSN user can register 4.Active ALG and see the communication flow by grasping packets in three scenarios.
Expected Result	MSN user can communicate in three scenarios.
Actual Result	Passed
Remarks	

5.2. Online gaming

5.2.1. QQ online gaming

Test Item	Online gaming
Sub-Item	QQ Online gaming
Test Objective	Check whether QQ online game has the same flow when ALG active or deactive.
Test Scenario	Scenario:1, 2,3
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Install QQ online gaming client on PC 3.Check whether PC can entry game room and play. 4.Grasp packets when ALG active or deactive.
Expected Result	QQ game user can entry game room and play.
Actual Result	Failed
Remarks	same public IP user can't entry the same game room.

5.3. Internet Video/music

5.3.1. Youku

Test Item	Internet Video/music
Sub-Item	Youku
Test Objective	Check whether Youku has the same flow when ALG active or deactive.
Test Scenario	Scenario:1, 2,3
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Go to Youku web site and view video. 3.Grasp packets when ALG active or deactive and analyse the flow.
Expected Result	User can see the film or listen to music in Youku web site.
Actual Result	Passed
Remarks	

5.4. Shopping online

5.4.1. Taobao

Test Item	Shopping online
Sub-Item	Taobao
Test Objective	Check whether Taobao user has the same flow when NAT actives or deactives.
Test Scenario	Scenario:1, 2,3
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Open browsing and input Taobao address. 3.Check whether user can shop on Taobao web site. 4.Grasp packets when ALG actives or deactives to see whether the flow are same or not.
Expected Result	User can shop in Taobao.
Actual Result	Passed
Remarks	

5.5. Bank

5.5.1. Industrial and Commercial Bank of China

Test Item	Bank
Sub-Item	Industrial and Commercial Bank of China(ICBC)
Test Objective	Check when user can use online ICBC bank web the service flow is same when activing/deactiving ALG.
Test Scenario	Scenario:1, 2,3
Test Procedure	1.Configure user IP pool in BRAS. Configure NAT444 and IPv4 public pool in CGN. 2.Open browsing and input ICBC Bank address. 3.Check whether user can use online bank to transfer 4.Grasp the packets to analyse the flow when ALG actives or deactives.
Expected Result	User can use online bank on web site.
Actual Result	Passed
Remarks	

6. Effect analysis

6.1. User experience

User experience can't be quantified and we get the result only by subjective experience. Time delay, echo, fluency in video and audio are almost same as without NAT444 on network. Communications between CGN users and CGN user with public user are always normal. As a result NAT444 has no affection on the users' experience .

6.2. Testing summary

In all the applications aforementioned only FTP depends on ALG. We only test two levels NAT.

QQ online gaming does not permit two users use the same external public IP address in the same game room. When two users use the same external public IP address, QQ online gaming considers they come from

the same subscriber. If they are in the same game room, they are regarded as cribbers.

We only tested a bank account to use online bank since we only have one account.

We didn't test when eMule, Bittorrent work as internal server. This needs support of PCP.

When there is two levels NAT, users can't set internal server, such as FTP server, in home network.

Communication between CGN user and public IP user belonging to the same CGN is not processed by service board.

7. Security Considerations

8. Acknowledgments

9. IANA Considerations

10. Informative References

[draft-ietf-pcp-base-26]
IETF, "Port Control Protocol (PCP)", June 2012,
<http://tools.ietf.org/html/draft-ietf-pcp-base-26>.

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