

# **Carrier-Grade-NAT (CGN) Deployment Considerations**

draft-nishizuka-cgn-deployment-considerations-00.txt

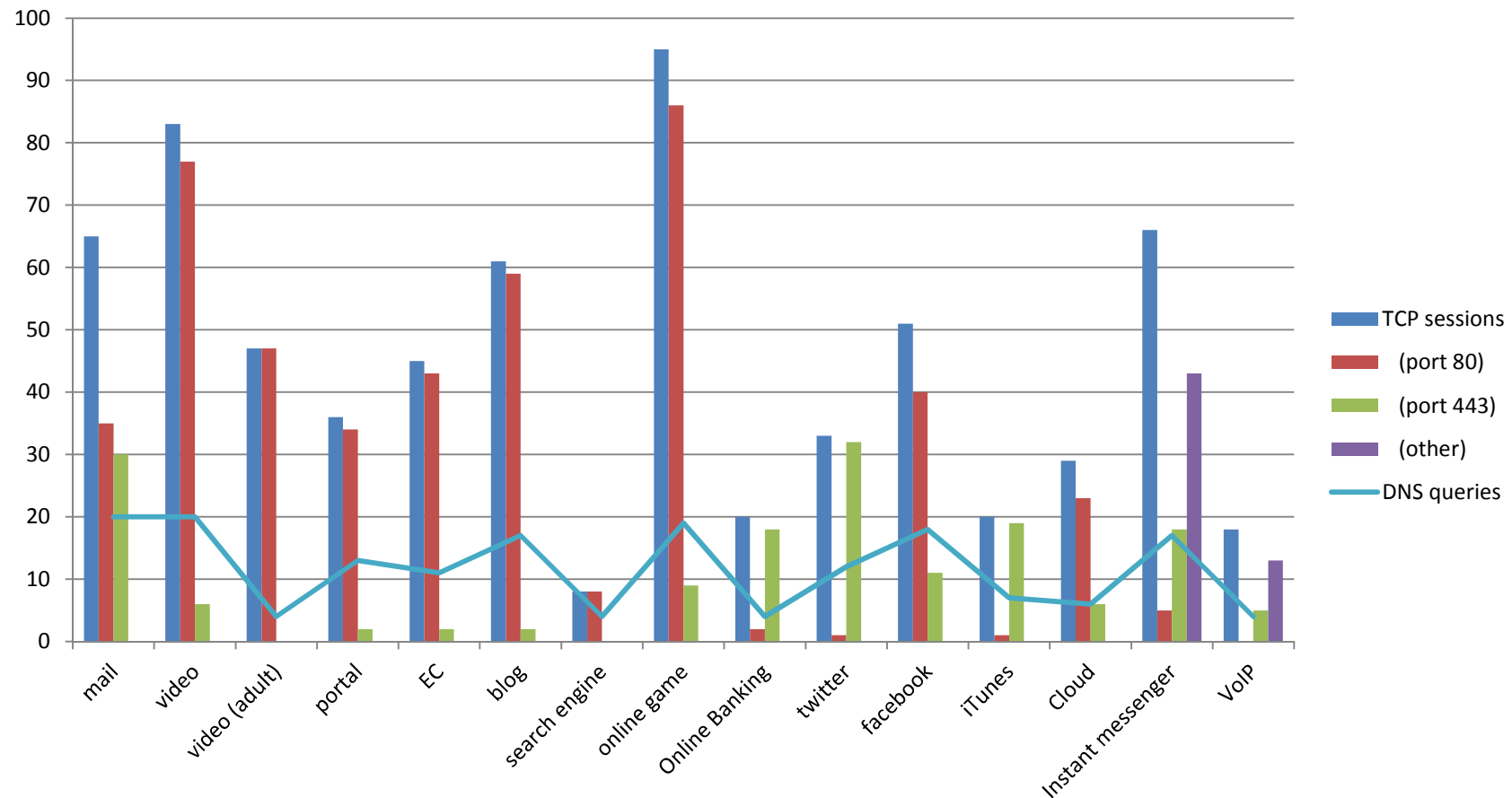
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# Overview

- **The efficiency of CGNAT is based on:**
  - **number of sessions allocated to each user**
  - **installation location.**
- **Investigation on the number of sessions of major applications.**
- **Feasibility of port assignment methods**
- **Specifying the optimum place according to CGN performance.**

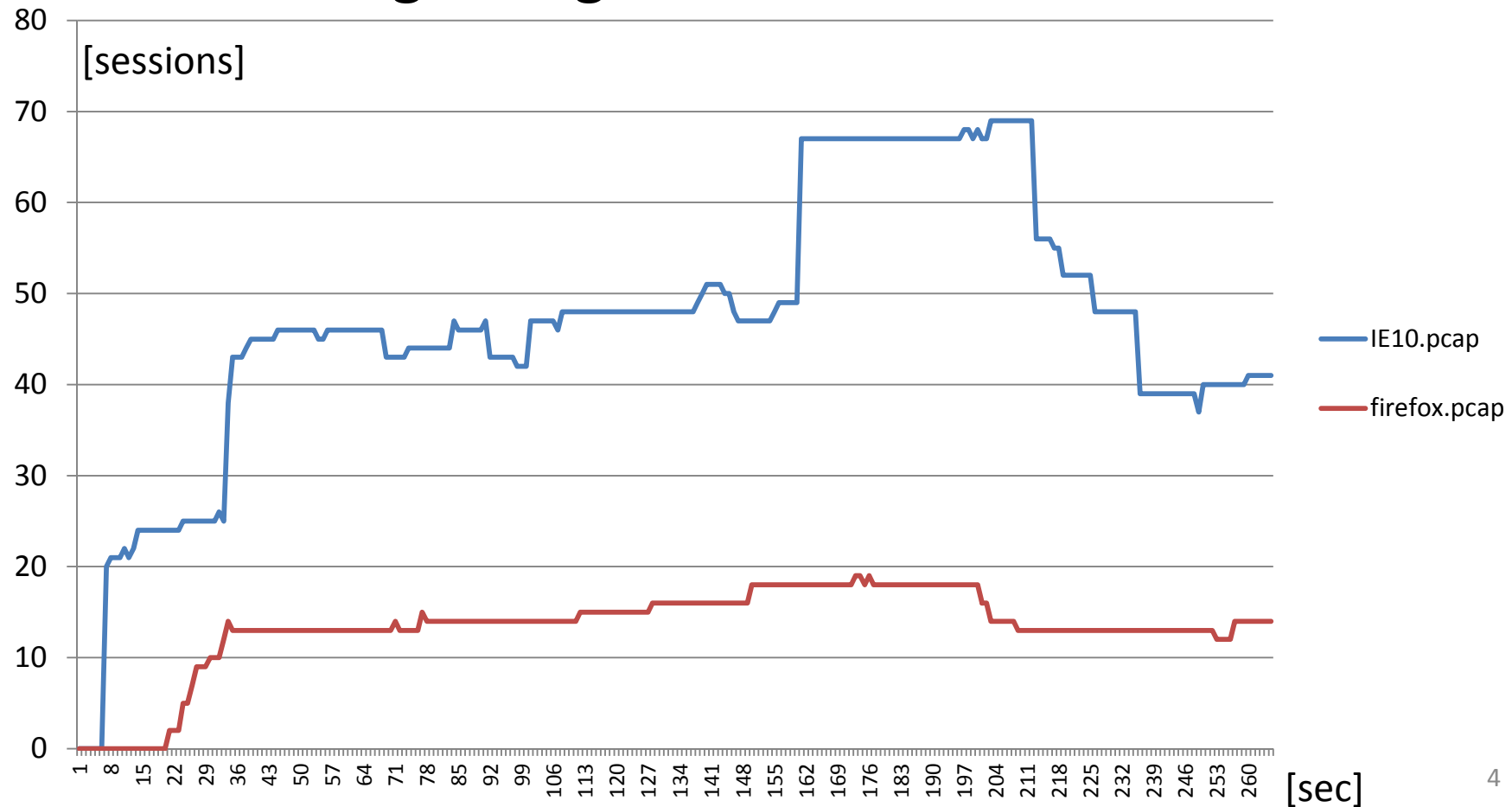
# The number of sessions

- The average number of sessions has become less than in 2009.



# The impact of SPDY(or HTTP/2.0)

- IE10 (not SPDY) vs FireFox21.0 (SPDY)
  - Browsing “Google MAP”



# Sufficient Sessions

- For security and fairness, we **SHOULD** limit the number of sessions per user when we use CGN [RFC6888].  
⇒ How many sessions are sufficient for every user?
- There are no longer high-consumption applications.
  - The number of sessions of applications is up to 100 sessions.
  - Modern applications (ex. Facebook, Google Map.. ) have changed to SPDY. The sessions are multiplexed.
- However, applications such as games still consume many sessions
  - It can be over 100 sessions.
- Moreover, how many applications are used simultaneously within a single CPE?

# How to allocate the pool-addresses and its ports.

- **There are 3 major methods.**
  - **Dynamic Allocation**
  - **Static Allocation**
  - **Port Block Allocation**

	Pros.	Cons.
Dynamic Allocation	This can use pool addresses and ports most effectively.	ISPs must keep records of all the NAT logs to deal with abuses and political commands.
Static Allocation	ISPs don't need to record NAT logs.	Pool IP addresses and ports are reserved to every users, so most of them could be a dead stock. This reduces efficiency.
Port Block Allocation	less logs are required than Dynamic Allocation.	less efficient than Dynamic Allocation.

# NAT Efficiency Estimation.

**# of pool address (P) =**

For dynamic allocation:

$$\text{\# of Subscriber (S)} * a * N / (65536 - R)$$

For static allocation:

$$\text{\# of Subscriber (S)} * M / (65536 - R)$$

a: % of active user.

N: Average ports per user.

M: Maximum ports per user.

R: Reserved(eliminated) ports.

- From our investigation, a=25%, N=400, M=1000.

In this case, Dynamic Allocation is 10x efficient than Static Allocation.

- We eliminated lower ports(0-32767) for security reason.

Is there any existing rule for usable ports of NAT?

# Amount of the NAT log

**The size of the log is the main consideration of CGN.**

**<mandatory information>**

information	byte
timestamp	8
CGN hostname(ID)	1~2
Transport protocol	1
Add/Delete flag	1
untranslated source address/port	6
translated source address/port	6

**<log format>**

**In ASCII format, ~120 bytes/record.**

**In Binary format, can be reduced to 1/4th to 1/5th.**

**<Experimental Results>**

**For 1,000,000 users, the size of log is piled up to 6.4 terabyte per day.(in ASCII)**

**To deal with the legal request from servers which are not compliant with [RFC6302], logging destination address is necessary. However, destination logging breaks the merit of static allocation and block allocation.**



# Where to place the CGN

## **<CGN performance>**

### **Capacity Factor:**

- Through put
- MCS: Max Concurrent Sessions
- CPS: Connections per Sec

**To generate realistically balanced traffic is important.**

**At this time, some CGNAT has capacity of over 160k users.**

## **<Considerations>**

- High density and High availability
- Separation of the NATed and non-NATed traffic.
- Speaking dynamic routing protocol

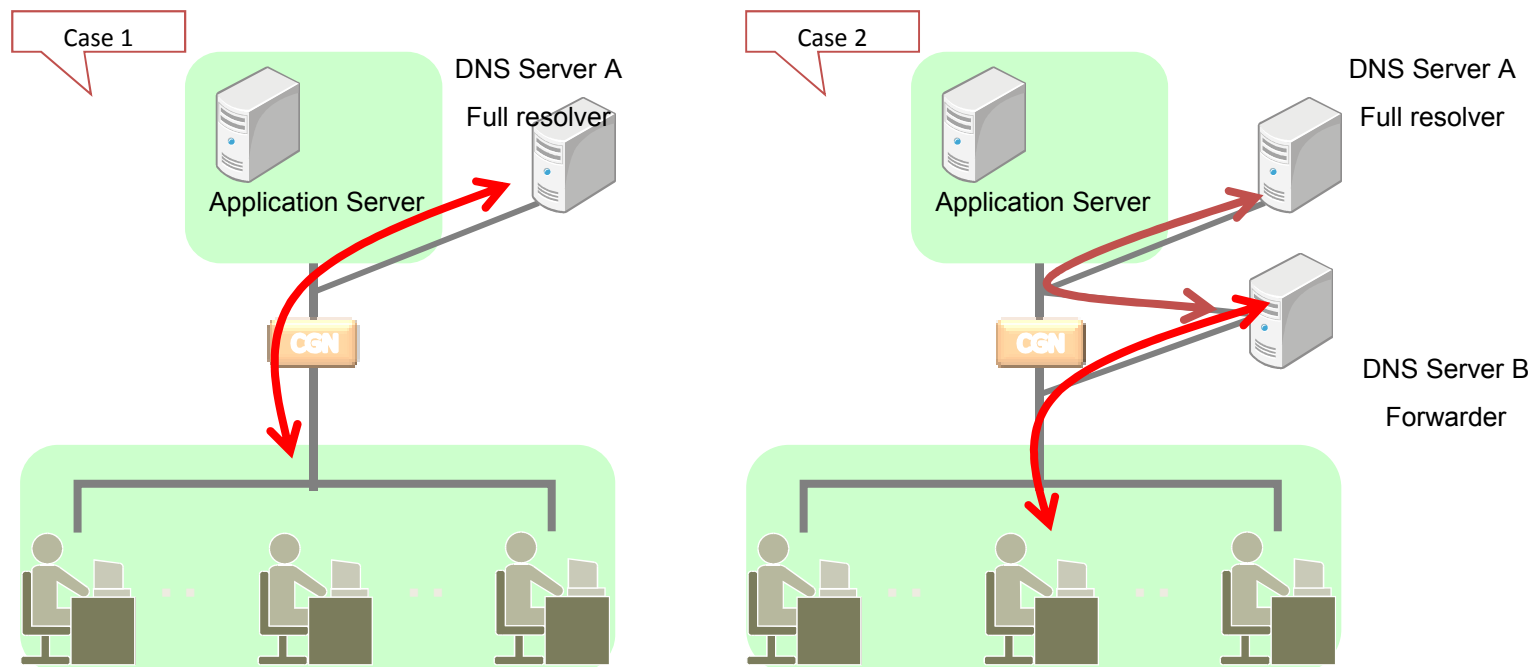
**⇒This topic has liaison to the [I-D.ietf-opsawg-lsn-deployment]**

# Where to place the CGN

## <DNS considerations>

Should we bypass DNS queries to avoid intensive port consumption?

⇒ No, NAT table of DNS timeouts in 3 seconds, so the consumption of NAT tables is not so much. As the result, it did not affect the performance of CGN.



# Future work.

## **Mobile network**

- investigating port consumption behavior of mobile services and applications**
- mobile network quality and its effect on the performance of the CGN.**

**We will add the result of the mobile network experiments on the next or later revision.**

**Thank you.**