High-speed Address Hiding Function for Next Generation Networks

Kei Kato Shugo Shiba

With the penetration of ubiquitous services, seamless communication between end systems will be one of most important factors in the next generation network a.k.a. NGN. Seamless communication allows users to communicate regardless of its location. This merit, on the other hand, will reveal users' location-related information to called parties or even third party users. Especially during roaming status, third party might be able to analyze sender IP address very easily, meaning that the location of caller can be identified. To solve this problem, address hiding can be attempted. As an infrastructure of NGN is expected to be applied such solution very frequently, address hiding should be done with high performance and low-latency. This paper introduces our prototype of such network device that is equipped with address hiding as well as future needs of such technology.

Introduction

With the penetration of mobile devices, network infrastructure is required to be mobility oriented i.e. roaming and handover must be performed. Such technology is day by day improving through standardization bodies. By changing mobile devices' access point dynamically, sender address might change. As an IP address is assigned by access point, if IP address assignment has to do with physical location of access point, mobile device's location might be revealed among caller or third party. This might occur privacy

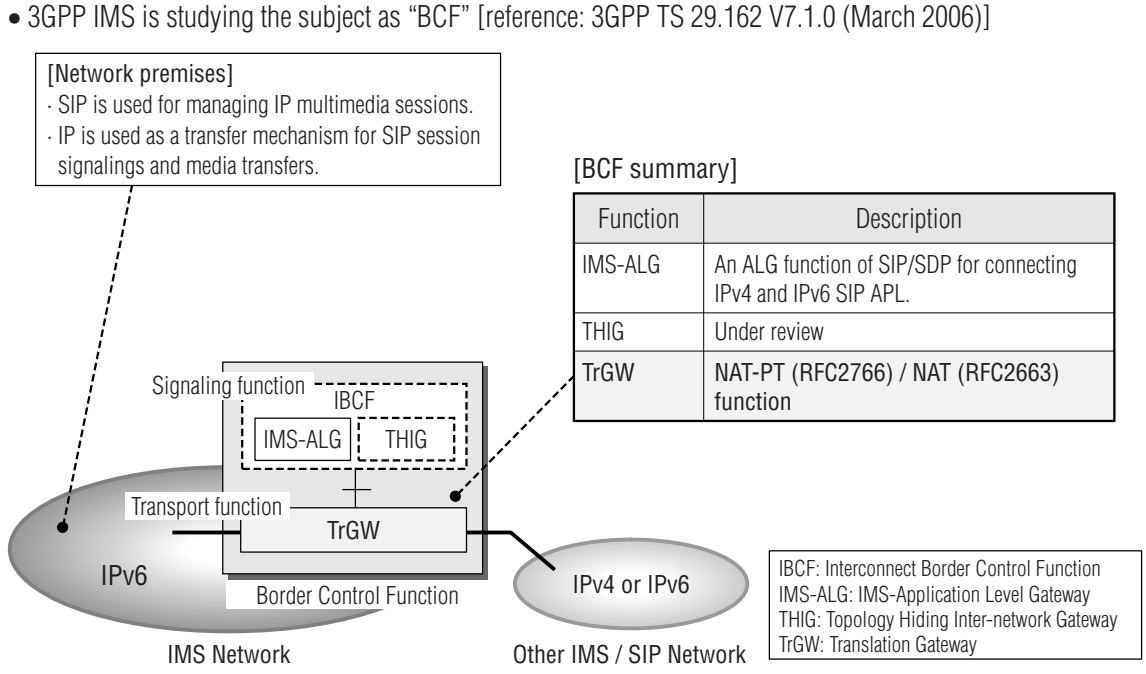

Fig. 1 Standardization of border control functions in 3GPP

infringement. Therefore, such issue must be solved.

Currently, Third Generation Partnership Project or 3GPP, a standardization body for 3G mobile infrastructure, is standardizing Border Control Function or BCF as a gateway for IP Multimedia Subsystem or IMS networks. BCF is comprised of Interconnect Border Control Function or IBCF and Translation Gateway or TrGW. IBCF handles signaling-related network connection function whereas TrGW takes care of transport-related one. TrGW has to perform IP translation function for connecting networks with difference network protocol i.e. IPv6 and IPv4, whereas address translation is needed for network with same network protocol i.e. IPv4-IPv4 or IPv6-IPv6 network. Such TrGW functionalities enables for called party or 3rd party to analyze sender IP address. Therefore, IP translation and address translation function acts as address hiding function.

The following section describes issues and solutions for implementing such TrGW with address hiding functionality.

Issues

The most important issues for implementing address hiding functionality into TrGW is achieving high performance and low latency. In the next generation network such as IMS is for network carrier network. Therefore, tens of millions of subscribers will use the network concurrently. Therefore, TrGW requires to have a capability of up to millions of concurrent sessions that can have address hiding service. Moreover, low-latency is needed as well. This is because next generation mainly handles voice and video. This means main traffic characteristics will become short-frame. The traffic characteristic of The Internet mainly consists of both minimum frame (64byte) and maximum frame (1500byte). The short-frame-oriented network requires much more processing of short-packets. This might occur latency. Therefore, to achieve high-quality service, reducing latency in TrGW is strongly needed.

Currently, to solve this issue, we have developed prototype of TrGW. By this prototype, we expect to have an implementation of high-performance and low-latency address translation. The next section depicts details of address hiding solution by showing our implementation.

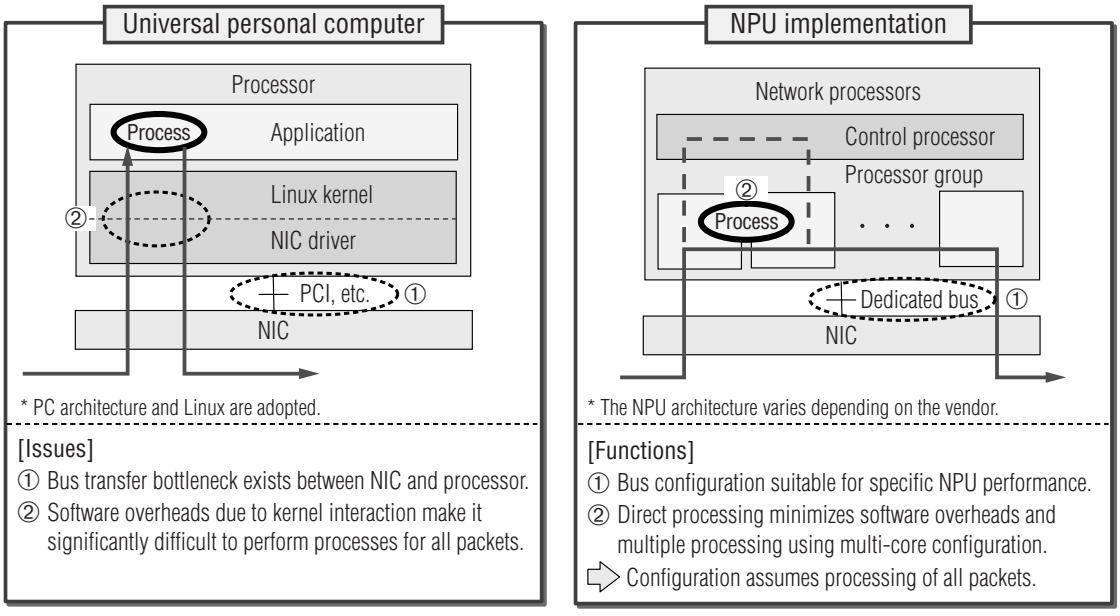

Fig. 2 Differences between modes using universal personal computers and network processors

Address Hiding Solution

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Conclusion and future works

By taking advantage of NPU, we have achieved high speed address hiding function for next generation network, which is expected to have address hiding functionality with an emergence of ubiquitous service. NPU is customized for packet processing and expected to enjoy high-performance and low latency. We have implemented address hiding by assigning different function on FPGA and NPU processors to optimize performance and created prototype that is aimed for achieving high-performance and low-latency. In the immediate future, we would evaluate this prototype over various kinds of networks and improve it towards commercialization.

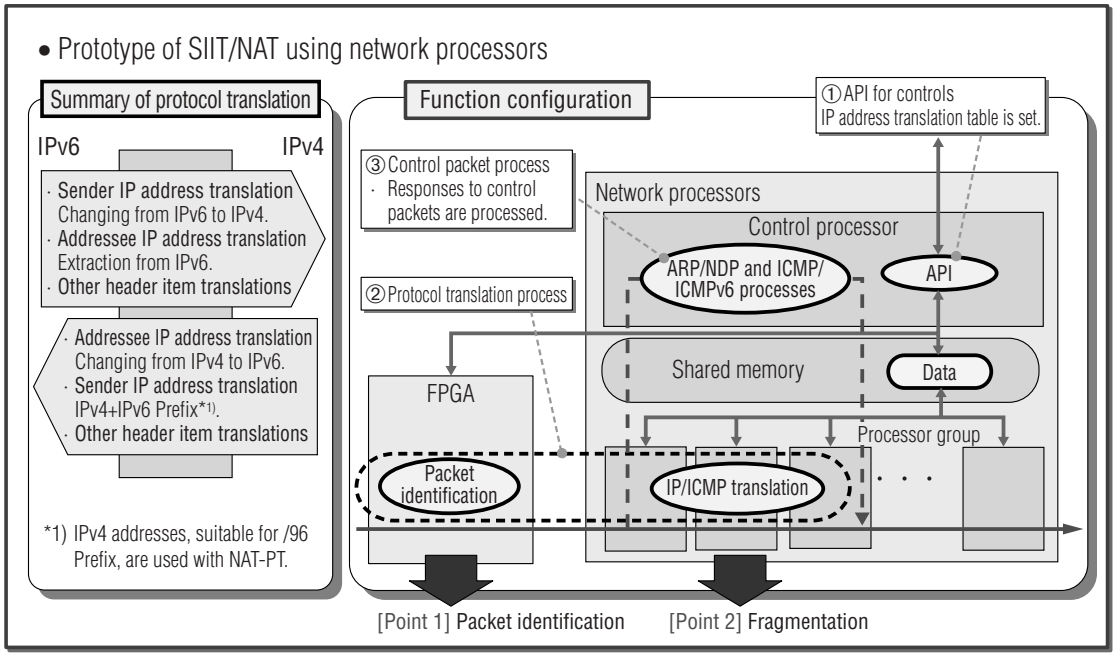

Fig. 3 Summary of implementation method

References

1) 3GPP Technical Specification 29.162, Version 7.1.0, 2006.
2) SIIT: Stateless IP/ICMP Translator (RFC2765), 2000.
3) Traditional IP Network Address Translator (Traditional NAT) (RFC3022), 2001.

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