

公益財団法人 セコム科学技術振興財団
研究成果報告書

研究課題名

ネットワークトラフィックに直接介入するサービス指向ルータにより
展開される新たなスマートサービス

New-generation smart services provided by service-oriented router with novel
functions of network traffic analysis and content-based services

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Abstract

Over 20 years have already passed since the first year of the Internet. We receive its benefits at any moments. However, several problems become obvious. How to solve the network neutrality problem? Why was innovative technology not proposed in Internet security? Why does it limit to end-to-end services? Why cannot it provide services which bear close on the network? Why does it limit to IP-based routing? Why cannot it provide real-time services? What is the solution to the intrusion problem of private information? What is the solution for the heavy network load brought by IoT devices? These questions should be solved soon. Here, we got a conclusion that the function and services of Internet backbone router should be changed to give effective solutions for those problems.

Here, we started a study of designing and implementing Service-oriented Router (SoR). SoR is different in its function from the general Internet routers or switches because it can handle the network traffic contents directly at the core network of the Internet and other branches of the Internet. Therefore, SoR is required to capture network traffic and access to internal contents of the network traffic. To achieve this special feature of SoR, it has the following functions. Firstly, it reconstructs over several million TCP streams at the same time with a small memory. Secondly, it decompresses gzip compressed streams and decodes chunked data. Thirdly, it also decodes SSL and TLS encryption by exchanging the secret key of encryption algorithm with servers or clients. Fourthly, it obtains needed character strings by using regular expression-based string matching and extraction and stores the extracted strings into high-throughput database management system. Finally, it provides solutions by using its common API, which enables to open the obtained strings as contents of the network traffic. This processes can solve the given problems. However, actually, Internet traffic includes private information. The information should be preserved from the perspective of privacy protection. SoR also provides services for this protection, such as anonymization function and water printing function of the anonymized data.

Network neutrality problem will be solved by making businesses of network carriers using the data provided by SoR. SoR can directly scan and neutralize the threat of cyber-attacks. Moreover, it can provide new measures by using the Internet traffic access patterns for the scan. As an innovative technology, SoR can seize the current behavior or taste of users in the manner of inter-domain analysis. Adding to the general end-to-end services, SoR can shift the service application location appropriately in the hierarchy of the network without changing destination IP addresses of a stream generated by IoT devices. As an example of network-oriented services, SoR provides flexible CDN (Contents Delivery Network). As more fundamental services of CDN, SoR can provide CCN (Contents Centric Network), which releases the limitation of IP addresses in routing process by coexisting with the conservative Internet. SoR can improve the real-time specifications of services by shifting the cloud services to switches/routers services which are closer to IoT devices by using

on-the-fly information. SoR can provide an anonymization service on the Internet, and it can change the Internet from data hell of privacy violation to data heaven of privacy encapsulation. These services can be provided to even low-power low-performance IoT devices. SoR is a revolution network device, which enables these new services.