Connection Integration System for ICT Infrastructure Management

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***Abstract*—Many of recent network services are provided by NFV-based microservices to enable great dynamics in development and deployment. Including Kubernetes and OpenStack, there are several kinds of orchestrating tools that provides flexibility of deployments such as auto deployment, auto healing and rolling updates for ICT infrastructure. However, the management interface (e.g., SSH, telnet and Web UI) against ICT infrastructure tend to be complicated based on the number of components. Furthermore, most of management interface does not provide standard logging feature which is extremely important on ICT managements including controlling management operation and tracing management behavior. In this work, we demonstrate how these issues can be mitigated with the connection integration system called SMART-GW. Specifically, we first show how management interface against number of components in ICT infrastructure are integrated into single management system and how we can easily manage large ICT infrastructure. Then, we show how the behavior against management interface is logged for each connection.**

I. Introduction

Recent network services are supplied by microservices to satisfy user's requirements and to provide various kinds of service deployments [1]. To satisfy the requirements against quick pace of service developments, several kinds of infrastructure orchestration tools including Kubernetes and OpenStack are becoming ready on commercial environment. These kinds of tools provide many kinds of automation feature such as auto deployment. Such features are provided not only for applications but also for network elements such as routers, load balancers and switches with orchestration tools. For example, configuration against cisco routers could be done automatically with ansible or OpenDaylight. By combining these orchestration tools, the network services may be provided without accessing actual infrastructure directly. The only thing that developers have to do is push codes against version control software. After that continuous integration system runs tests and builds it and orchestration system applies the updates.

Although, automation against deployments became flexible, it is still required to access ICT infrastructure directly on the management phase. Since deployment of ICT infrastructure became flexible and dynamic, it became harder to check what is going on when problem occurred in target service. For example, operators may have to connect against several servers and routers with different authentication credentials and protocols (e.g., telnet, SSH and Web UI). Some of orchestration tools provide console to access ICT infrastructures, it is not still integrated well. Furthermore, such a management interfaces do not provide standard logging tool which is extremely important on ICT managements. Since the human operation error is still the critical factor of service failure, the requirements of logging management operations are becoming especially important in recent microservice era [2].

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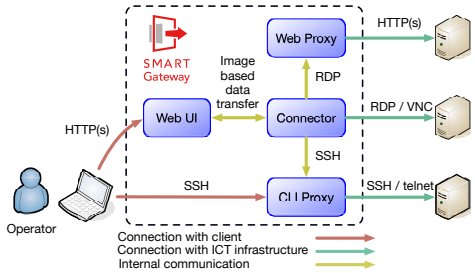

Fig. 1. Abstracted architecture of SMART-GW

To overcome these issues, we developed connection integration system called Simple Management of Access Restriction Translator GateWay (SMART-GW). This system integrates all the management interface into single management system and provides logging management operations. Additionally, it also provides connection restriction features. Of course, because this system centralizes all the connections, operators can access to the all ICT infrastructures by just accessing to SMART-GW. To the best of our knowledge, SMART-GW is the extremely unique system that integrates connections and provides several features against connections against ICT infrastructure. We will describe how SMART-GW mitigates issues explained above in this demonstration.

II. Architecture

Figure 1 describes architecture of SMART-GW. In the following, we explain each module in detail.

1) Web UI: This module serves web UI of SMART-GW. User can access this module with browser and connect to ICT infrastructure using WebSocket. Web UI communicates with connector which converts actual protocols with image-based data, and web UI shows image data to user. This means that SMART-GW provides client-less access against ICT infrastructure.

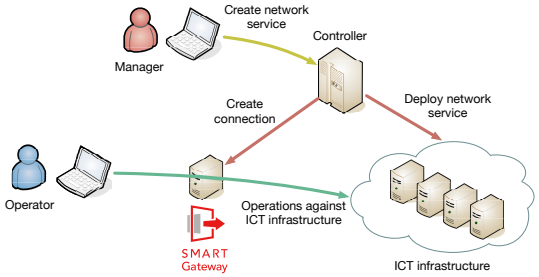

Fig. 2. Architecture of demo setup

2) Connector: Connector roles as hub of each protocol against ICT infrastructure. GUI based protocols such as RDP and VNC are connected directly from connector. On the other hand, CLI based protocols such as SSH and telnet are connected via CLI Proxy. Web UI based system such as web console for routers is available to connect via Web Proxy. This module records all the graphical sessions to log who did what. Additionally, connector can share the current session against another user. This means that SMART-GW will provide double check scheme of operation between operators in remote place.

3) Web Proxy: This module provides HTTP connections. In this module, xRDP is running and web browser (e.g. midori and chromium) runs in single application mode for each session. Web Proxy also provides access logging and URL blocking features. By using these features, more detailed operation logs against web system will be recorded and access control for each user can be implemented.

4) CLI Proxy: CLI Proxy provides access controls and session managements for SSH and telnet. This module records typescript and command logs which user hits. Also, command restriction is provided in this module. For example, we can allow shutdown command against some users, on the other hand others cannot. Additionally, direct SSH session will be handled in this scheme by redirecting it to CLI Proxy.

III. Demonstration

Figure 2 shows the architecture of demo set. To demonstrate how SMART-GW can contribute with simple and centralized management against ICT infrastructure, we prepared simple dynamic ICT infrastructure provided by docker. Our demonstration is constructed with following 4 phases.

1) Create connections dynamically for user based on service deployment.
2) SSH session against ICT infrastructure via Web UI.
3) HTTP session against ICT infrastructure via Web UI.
4) Check and investigate logged session data.

We first create the new network service and deploy them against ICT infrastructure via controller. After that controller will create a connection for managements against ICT infrastructure in SMART-GW. Of course, operators should be only able to use connections against components of ICT infrastructure that they are going to manage. After that, we will establish a SSH connection via Web UI as described in figure 3 and hit several commands and check that commands are recorded correctly. Then we will do similar thing with HTTP connection as described in figure 4. At last, we will check and investigate that session logs including display logs and typescripts are recorded as expected.

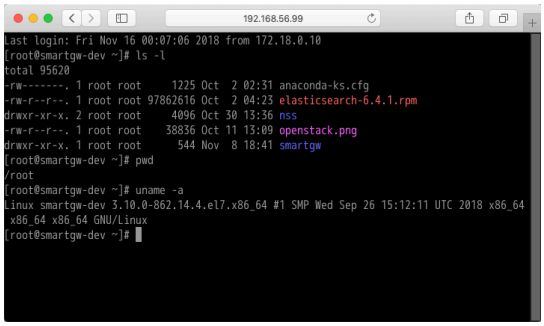

Fig. 3. SSH connection via Web UI

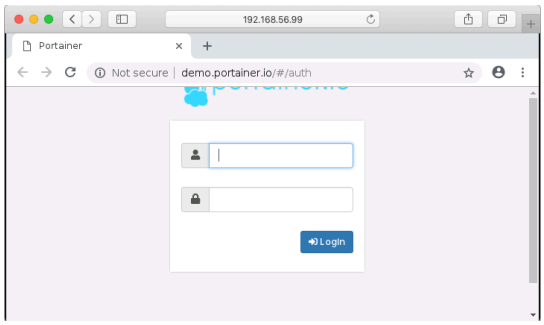

Fig. 4. HTTP connection via Web UI

IV. Conclusion

In this paper, we implemented SMART-GW, the integrated connection management system and demonstrated how it works with very flexible ICT infrastructure. The client-less and centralized connection management against ICT infrastructure allows operators to manage ICT infrastructures very seamless. Additionally, each logging feature records user behavior in detailed level.

SMART-GW is deployed in commercial environment including 100,000 nodes as ICT infrastructure. As future work, we are going to apply AI against logs collected in this environment to determine what the user is trying to do or get difference between high leveled operator and low leveled operator.

References

[1] F. Németh, R. Steinert, P. Kreuger, and P. Sköldström, "Roles of DevOps tools in an automated, dynamic service creation architecture," in *2015 IFIP/IEEE International Symposium on Integrated Network Management (IM 2015)*, Lisbon, Portugal, May 2015.

[2] T. Hayashi, "IT management for IoT era (A real Web of Things and Intelligent management for network career)," in *The 19th Asia-Pacific Network Operations and Management Symposium (APNOMS'17)*, Seoul, Korea, September 2017.