

Common Hardware Reference Platform for Smart Networks : Management of NFB

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Abstract— This paper proposes management technology of network function board where network common hardware platform which supports general purpose network services. As the SDN (Software Defined Network) and NFV (Network Functions Virtualization) technologies develop, the needs for low-cost hardware systems to build diverse and flexible network services are more and more increasing. According to the needs we proposed already a common hardware reference platform including network function board with goals to rapidly develop high quality network service solutions. And then we additionally provide the management technology between shelf management controller and the network function board placed in network common hardware platform. This paper describes scope and component blocks for management of NFB and specifies management flows, IPC (Inter Process Communication) protocol and sequences related management messages.

Keywords— Common Hardware Platform, Network Function Board, Management of Network Function Board, SDN (Software Defined Network), NFV (Network Functions Virtualization)

I. INTRODUCTION

This paper deals with management of NFB (Network Function Board) and is second part of series regarding hardware common platform for smart networks which consists of NFB and management of the NFB. The goal of this paper is to explain how to manage the NFB which is main component of hardware common platform and was already introduced in related paper[1] about mechanical specifications and board appearance. For the management of NFB this paper describes the details of component blocks, management flows, FRU (Field Replacement Unit) repository, communication messages, and events between shelf management component and NFB. This paper may be applied to build new open networking markets and network service models which can easily be developed by third parties. It may also be expected to support the interoperability of hardware common platforms and NFB and finally to promote small network equipment businesses on open networking environments.

II. SCOPE AND COMPONENT BLOCKS

We developed the reference framework of common hardware platform which includes the NFB and this paper describes management of NFB. Because general scope for management of NFB is so wide we focus on explaining component blocks including NFB and shelf management controller, IPC messages between component blocks, event lists and sequence flows. As depicted in figure 1, it shows components blocks and the connectivity between components.

In figure 1, we can find 4 component blocks, ShMC (Shelf Management Controller), MESA (Managed Ethernet Switch Assembly), FIB (Forward Interface Board) and NFB. The ShMC is a main component for managing of NFB which sends sensor data, system events and FRU information to ShMC. The MESA enables communication between the boards through the backplane of the shelf. The FIB allows for NFB to connect to the backplane and provides hardware abstraction that allows independence from the backplane. The MESA and FIB are assistant components for insertion and/or withdraw of equipment and for communication-bridge between ShMC and NFB. The thick dotted arrow in figure 1 shows the channel of communication for virtual control signalling. Using this channel the ShMC gathers the SEL (System Event Log) and SD (Sensor Data) information in the NFB. Two thin dotted arrows indicate the channel of the communication to the physical link. Hardware channel for communication between each components use 1 Gbps ethernet port.

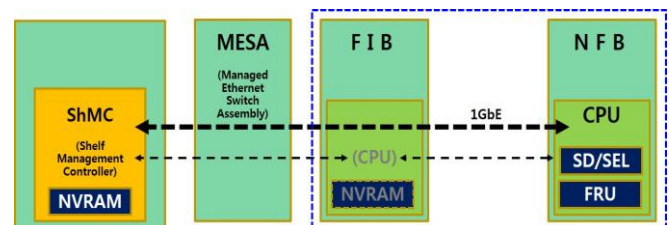


Figure 1. Component blocks for management of NFB

The roles of management of NFB are as follows:

- Components such as NFB for communication with the ShMC have FRU repository.
- The FIB which communicates with the ShMC performs software bridge.
- NFB exchanges system up and system down information with ShMC.
- NFB can be mounted directly on the backplane.

III. MANAGEMENT OF NFB

A. Management flows

The management flows of NFB composed with 3 steps insertion, polling, and IPC as depicted in Figure 2. At the first insertion step, FIB can detect the insertion of NFB and inform the appearance of new equipment to MESA in the system. When the NFB powers up, it resets CPU and IPC channel between NFB and ShMC and the NFB sends system information regarding device ID, IPC protocol version, type of CPU, memory size, serial number and FRU category to the ShMC via multi-cast communication. After receiving system information ShMC can request FRU information containing the number of ports, slot id, addresses such as MAC, IP and version of hardware/software of the NFB. According to the system and FRU information the ShMC updates and saves configuration data. When NFB detects ejector out interrupt signal withdraw flow is started.

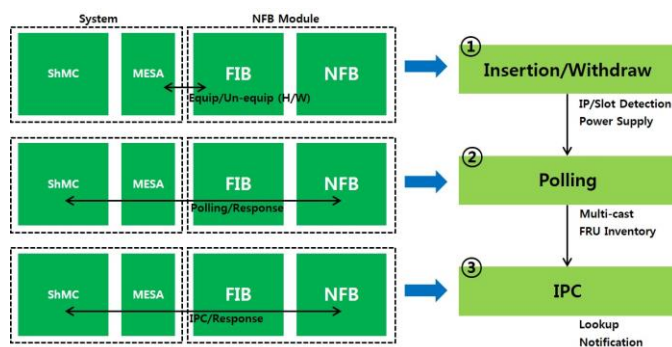


Figure 2. Management flows of NFB

B. IPC Protocol

For management of NFB, we designed IPC protocol including header/body format, IPC messages, error-codes and so on. We have three message formats such as Request, Response and Notification. And header size is same as 272 bytes and total message size cannot exceed 8,192 bytes regardless message formats. Also we defined IPC messages to request and response NFB information as shown in figure 3. These messages are comprised of several global mandatory messages related in device ID, reset of NFB and optional messages about FRU and status information. For the reset we provide two types of reset messages “cold reset” and “warm reset” and usually the “cold reset” is used when the “warm reset” is failed. Using optional messages we can get FRU information, FRU attributes, CPU status and NFB status. Event notification about temperature, main processor, memory,

system boot-up and system reset from NFB sensor data is compulsory.

	Class	Number	function	description
Global	ID	Global_Msg_01	Get Device ID	- Get Device ID of NFB
	Reset	Global_Msg_02	Cold Reset	- NFB H/W reset - In failure of Warm Reset, Cold Reset
		Global_Msg_03	Warm Reset	- Soft Reset of NFB
	Down	Global_Msg_04	System Withdraw	- (NFB)System withdraw request
		Global_Msg_05	CFM System Down	- (NFB)System withdraw response
Info	FRU	FRU_Msg_01	Get FRU_INFO	- Get FRU Repository info
		FRU_Msg_02	Get FRU_ATT	- Get FRU Repository attribute info
	Alive	Health_Msg_01	Check Health	- Check CPU status
	Polling	Polling_Msg_01	Polling	- Check NFB Status (1s)
	Event	Event_Msg_01	Info Event.	- Event Notification from NFB

Figure 3. IPC Messages

C. Sequences of Reset

As describing flows of insertion and withdraw in management flows, Fig. 4 introduces sequences of reset. When the ShMC requests “cold reset” to NFB, the NFB carries out hardware reset and replies the result. After IPC channel is ready for communication the ShMC collects NFB system information about device ID periodically and updates management tables. In addition ShMC can gather FRU information from NFB in case of NFB supporting optional messages. In Fig. 4 the NFB can’t support optional message, it sends error message to the ShMC.

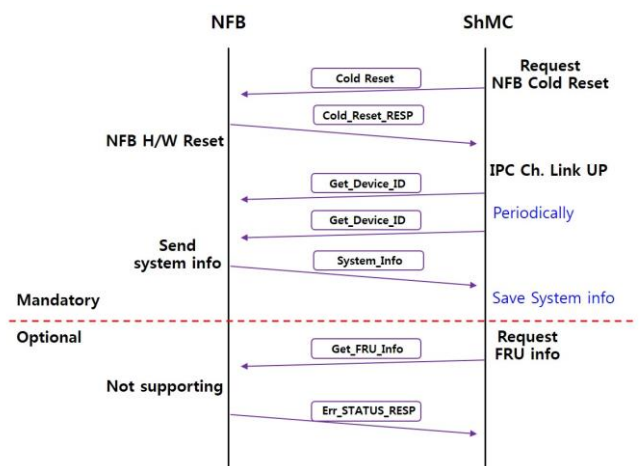


Figure 4. Sequences of Reset

IV. CONCLUSIONS

In this paper we focused on the management of NFB including components blocks and management roles of ShMC and NFB. For the details of management we explained management flows between component blocks and we designed IPC protocol by identifying header format, IPC messages, event codes and error codes. Additionally this paper shows one example sequences of Reset including mandatory and optional IPC messages and flows. This paper can be expected to improve the quality of domestic network industry

by using this simple common hardware platform and management technology of network function board.

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