

Scalable network visualization with RCPs

Takayuki MURANAKA, ALAXALA Networks Corporation, muranaka@alaxala.com

Abstract

Demo will be done using the Reconfigurable Communication Processor(RCP) developed by ALAXALA Networks. RCP is a router with edge server that consists of Reconfigurable Service Modules(RSMs) and Reconfigurable Processing Modules(RPMs). RPMs are FPGA/ASIC based hardware and can be reconfigured to *Flex-Counters* and Data-Plane either of IP, MPLS and EoE (Ethernet over Ethernet). The Demo uses both of the mirror of actually flowing in SC18 traffic (10Gbps) and generated test traffic (100Gbps). The collected traffic statistics will be aggregated into 240 counters by country in real-time, which are realized with *Flex-Counters* in reconfigured RCP. Demo also shows that these steps can be carried out with multiple RCPs in a resource pool. NIRVANA-Kai developed by NICT¹ will receive the results of *Flex-Counters* via SNMP and visualize it on the monitor at 100Gbps wire-speed in real-time.

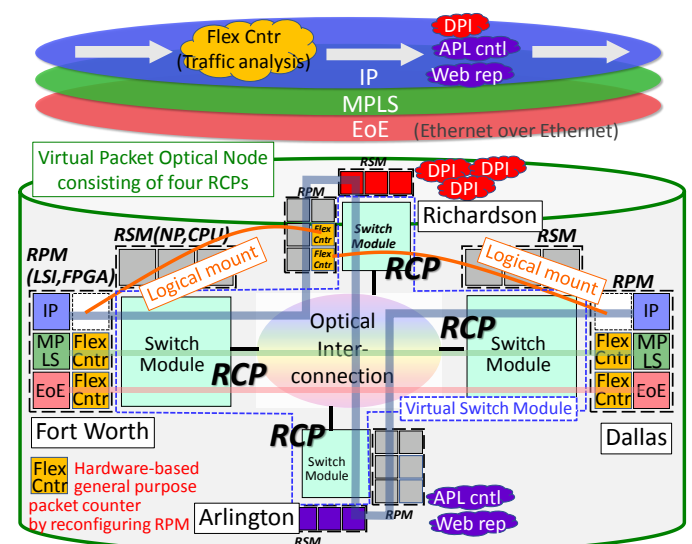
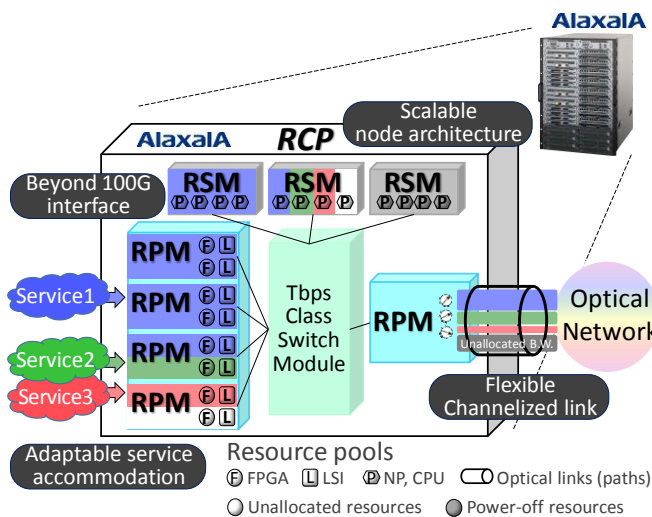
Concept : RCP Architecture

Reconfigurable Communication Processor (RCP): is composed of RPMs (Reconfigurable Processing Modules), RSMs (Reconfigurable Service Modules), and Tbps class (optical) switch modules which interconnect intra/inter RCP modules.

RPM is high speed (beyond 100G) flexible D-plane consists of LSIs and FPGAs. RSM is edge server for network applications consists of NPs and CPUs.

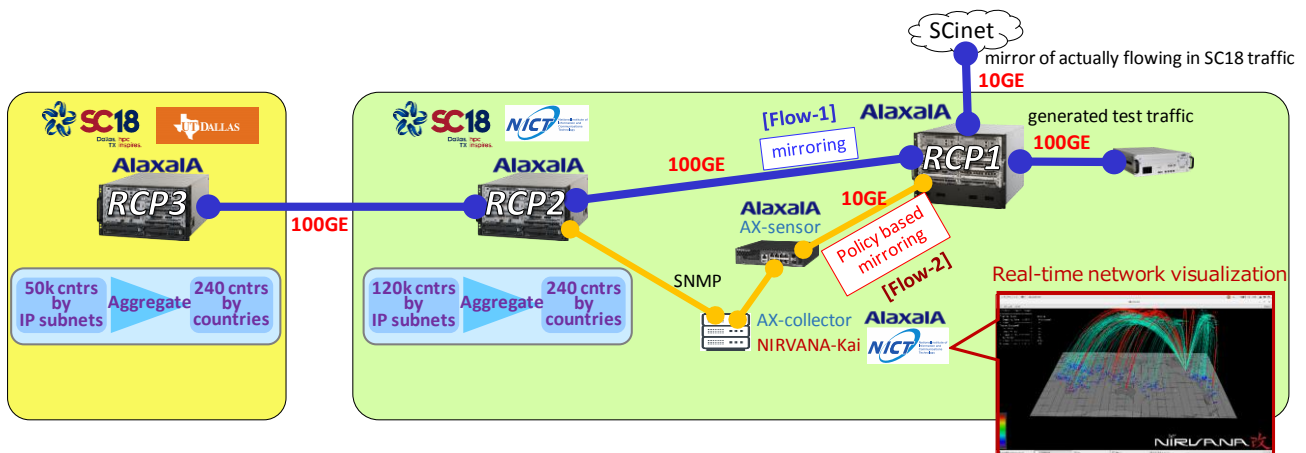
RCPs provide a virtual RCP node and an RCP resource pool by interconnecting RCPs with flexible channelized optical links.

Resource pools of hardware modules on RCP can adaptively provide multiple service slices. Packets are chained through logically mounted resource pools. Concept of resource pool is shown in below figure.



¹ National Institute of Information and Communications Technology

SC18 experimental 100GE network



We constructed the 100GE network cooperated with multiple RCP capable nodes and multiple servers. RCP is designed from flexible hardware and can be reconfigured to *Flex Counters*.

We show an example of traffic visualization which shows traffics flowing from which country to which country in 100Gbps wire speed and in real-time by *Flex Counters*. *Flex Counters* are flexibly reconfigurable statistics counters, in hardware resource pool in RCP. *Flex Counters* gather traffic data efficiently and these data can be visualized by NIRVANA-Kai.

Traffic used in the demonstration is both of the mirror of actually flowing in SC18 traffic (10Gbps) and generated test traffic (100Gbps). Traffic flow includes hundreds of thousands IP subnets.

RCP1 receives both actual traffic and test traffic. RCP1 mirrors both of these flows (Flow-1). At the same time, RCP1 mirrors some flows selected by “policy based mirroring” function (Flow-2) which should be analyzed in detail.

Visualizing [Flow-1] at 100Gbps

[Flow-1] is 100Gbps traffic and includes hundreds of thousands IP subnets. *Flex Counters* in RCP are 8-tuple² flexible reconfigurable counters which have 1M entries and operates at 3Tbps in maximum. Collecting function by *Flex Counters* can be carried out with multiple RCPs in a resource pool.

RCP2 and RCP3 are reconfigured to 120k *Flex Counters* and 50k *Flex Counters*, and collect statistics in cooperation. However, if we simply collect these 120k + 50k counters via SNMP, it takes too much time that we can't visualize these traffics in real-time.

Therefore, *Flex Counters* aggregate the collected statistics into 240 counters by country in 100Gbps wire speed in real-time. A large number of statistics is not useful for analyzing network, it is important to consolidate them into meaningful category (e.g. counters by country).

Aggregated 240 counters can be easily collected via SNMP. NIRVANA-Kai gathers these statistics efficiently and visualizes them in real-time.

² SMAC, DMAC, VLAN, SIP, DIP, PROTOCOL, SPORT, DPORT

Visualizing [Flow-2] at 10Gbps in detail

[Flow-2] is 10Gbps traffic and is selected flow which should be analyzed in detail at RCP1. [Flow-2] is send to AX-Sensor and AX-Collector made by ALAXALA. Although they don't operate in 100Gbps wire-rate, they are useful for detailed analysis of selected traffics.

AX-Sensor is an appliance machine for collecting packet statistics such as NETFLOW. AX-Collector is a network visualization software which can get network statistics from AX-Sensor. They can visualize the [Flow-2] statistics by not only network layer (e.g. 8-tuple) but also application layer with timestamps.

Goals

To show functionalities and performance of;

1. RCP/RPM which can be reconfigured to *Flex Counters* and handle beyond 100Gbps traffic in real-time, and
2. NIRVANA-Kai to visualize statistics by country, and
3. AX-Sensor and AX-Collector to visualize selected statistics in detail

Involved Parties

- Mio Suzuki, NICT, mio@nict.go.jp

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