Cost-effective Way of Monitoring Telco Networks

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Who I am

Junho Suh
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Research Area

- Applying Big Data and ML on Network Telemetry to extract Network Intelligence

- Programmable Switching Chip, P4, Open NOS, SDN, Data Center Networks

Research Experiences

- 2016-present: Developing Network Packet Broker (NPB) OS and Network Analytics Platform

- 2013-2015: Research on SDN, ICN, Future Networks

TINA (SKT integrated Network Analytics)

A high performance NPMD (Network Performance Monitoring and Diagnostics) solution

- Provides end-to-end visibility for network monitoring and troubleshooting

- Collects, processes, and analyzes network traffic and link/device status in physical/virtual networks
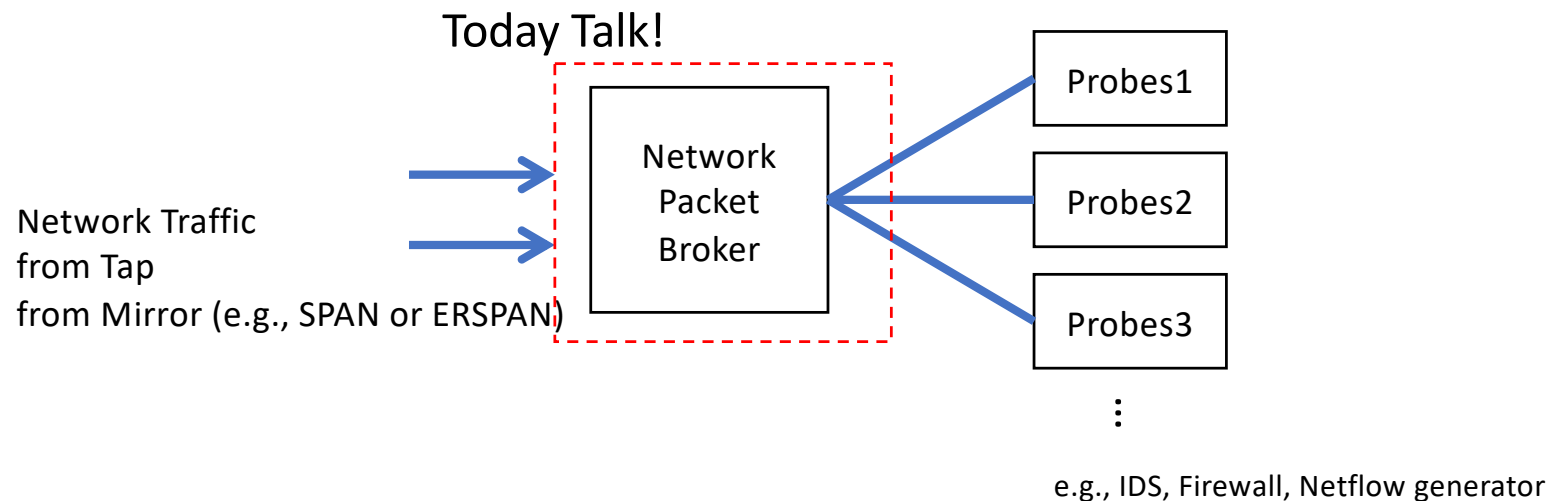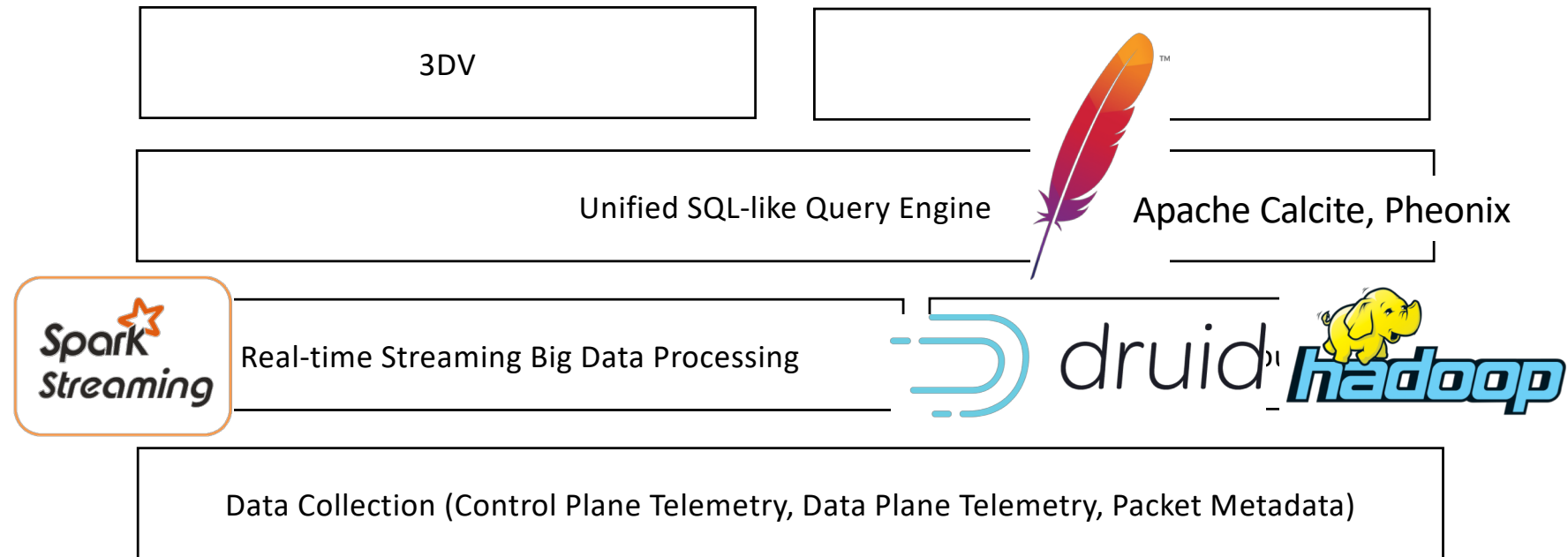
Open/Collaboration Approach

Proprietary hardware and software
Ex) Gigamon, Netscout, Ixia, Extrahop, …

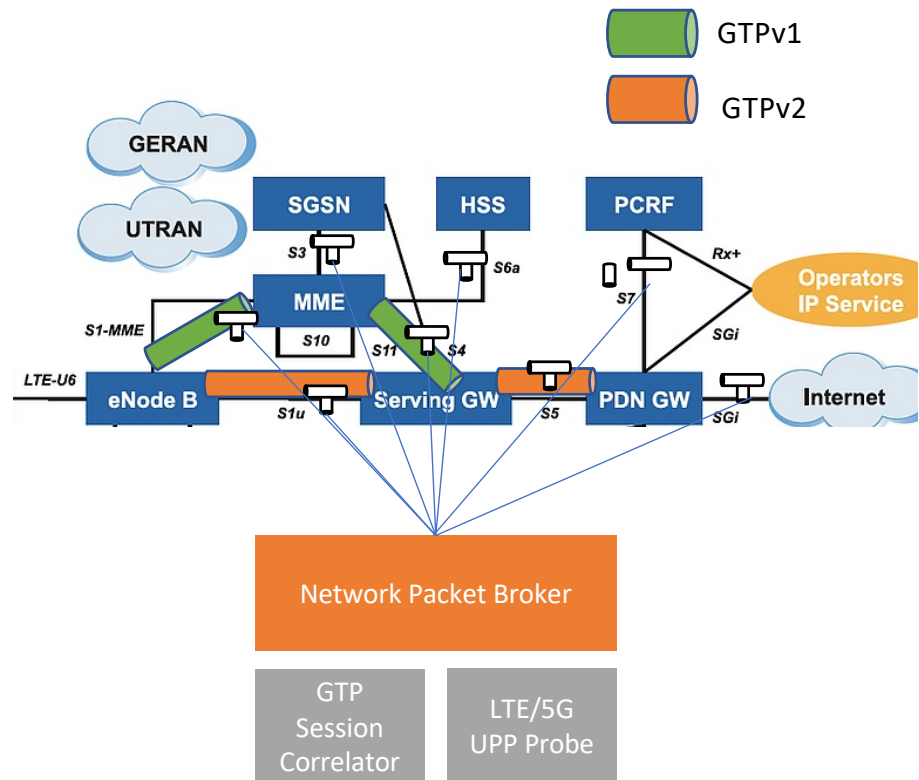OCP open hardware
Open source software stack
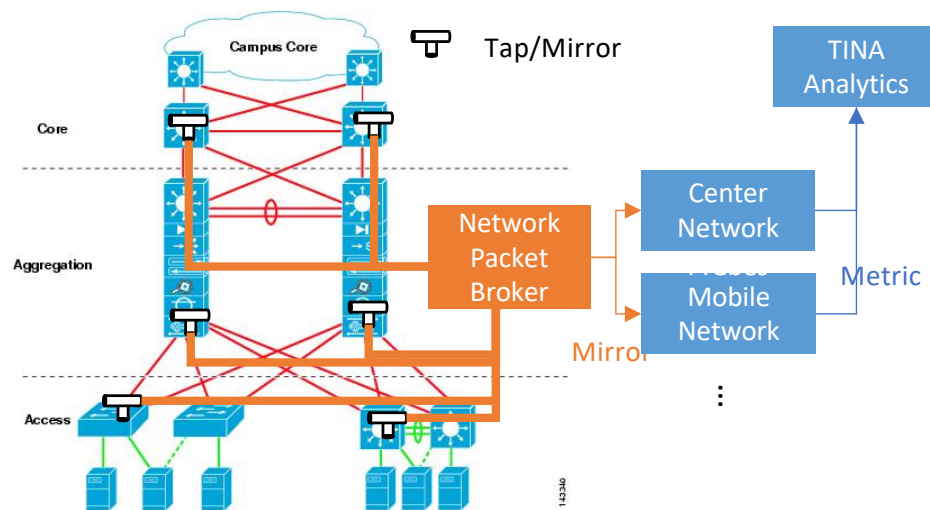
TINA Architecture

Use Cases

Public/Private cloud services

4G/5G mobile network services

ISP (SKB IPTV service)

Network Packet Broker (NPB)

An out-of-band network appliance

- Traffic aggregation from Tap/Mirror to monitoring tools

- Filtering
  - L2~L4 packet headers

- Redirection/Load balancing/Replication

- For Telco requirements
  - GTP protocol support
  - GTP inner user packet headers
  - GTP load balancing
  - IEEE 1588 based hardware time stamping

Server Switch (T-CAP) Hardware

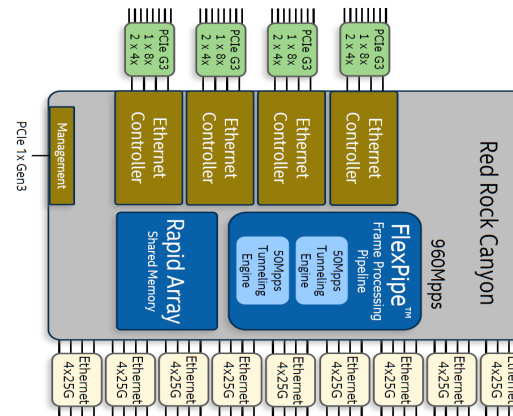OPEN
Compute Project

SK Telecom CNA-SSX2RC
(Service-Optimized
Hybrid Network Appliance)
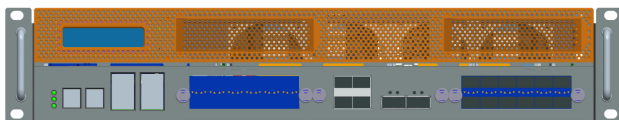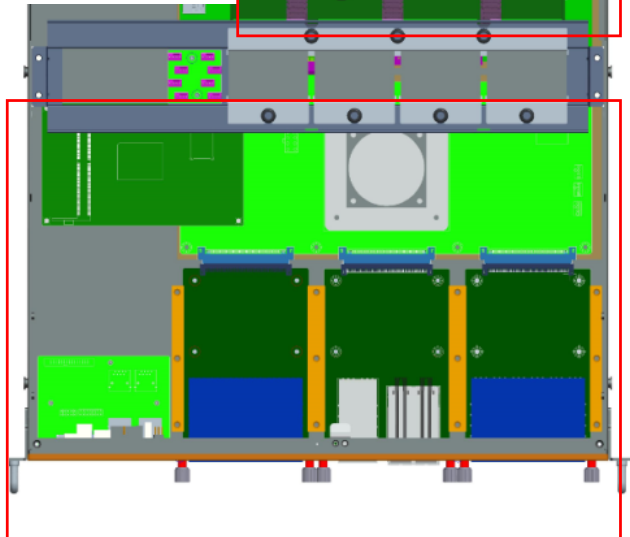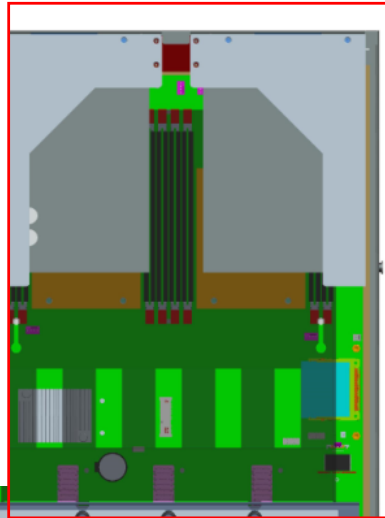
Dual Intel Xeon E5-2600 v3 CPU (Haswell)
Up to 512GB RAM
4X 2.5` SATA SSD

x4 PCIe gen3 Interface
(up to 200Gbps)

https://www.slideshare.net/JunhoSuh/specification-skt-cna-ssx2rc-20160821
https://www.slideshare.net/JunhoSuh/ocp-summit-2016-transforming-networks-to-allit-network-with-ocp-and-open-networking

T-CAP Software Stack

Server

DPDK

PMD PMD

Packet into flow aggregation | TCP | HTTP | DNS | GTP | VoLTE

PCIe PCIe PCIe PCIe

Switch

ovs-vswitchd
(vswitchd)

ovsdb-server

netdev-provider | ofproto-provider

IES SDK

OVSDB

Management Daemons
CLI, Rest, …

System Daemons
sysd, intfd, vland, …

HW Support Daemons
tempd, fand, pwd, pmd,

SKT Dev.

Intel Proprietary

Legacy

fm10k.ko

Kernel

FM10K I2C Transceiver LED/Fan/Pwd …

Device

Us

Limitations on Fixed-Function Switching ASIC and its API

Inflexible packet processing pipeline makes increase in engineering complexity

- Unnecessary packet processing behavior (e.g., L2/L3/multicast)

- Parser depth

- Header insertion

- Fixed table size

- Limited # of mirror sessions

SDK limitation

- Packet replication implementation

- Only available for multicast traffic (MAC addr, IP addr)

- Hashing fields selection (either outer or inner, or both)

- Load balancing algorithm

Programmable Switching ASIC with P4 Language

P4 is a formal language describing packet processing pipeline of Switching ASIC

- Open

- ASIC vendor independent

Easy to develop/test/bug fix/proof future features more fast than ever and without hardware upgrade

Easy to optimize memory resources (especially for TCAM) for each use case

Can create SDK based on auto-generated P4 program access APIs (e.g., P4runtime)

NPB.p4

P4-16

- Port / Port Group

- Filter / Filter Group

- Forwarding/Load balancing (resilient)/Replication

- IEEE 1588 based Time stamping (nanosecond granurarity) on ERSPAN type III & INT (In-band Network Telemetry) spec

Barefoot Tofino (2T, 6.5T)

SAI support

Q&A

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