APPLIED RESEARCH CENTER FOR COMPUTER NETWORKS

Platform for Network Functions Virtualization

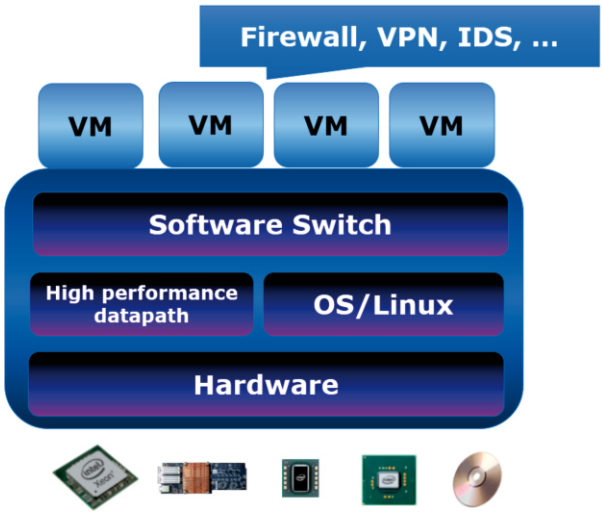
Network Functions Virtualization (NFV) is one of the hottest trend in the computer networking. The idea is to transfer specialized networking functions, such as a packet analyzers, firewalls and load-balancers, from middleboxes, which are proprietary and extremely expensive, to COTS (commodity servers), which is nowadays multi-core that supply the required performance for these network functions. This way is much flexible and chipper than traditional one. At the same time these functions must be able to communicate effectively (high performance) with virtual machines (to ensure required quality), which also work on commodity servers in data centers.

Our vision

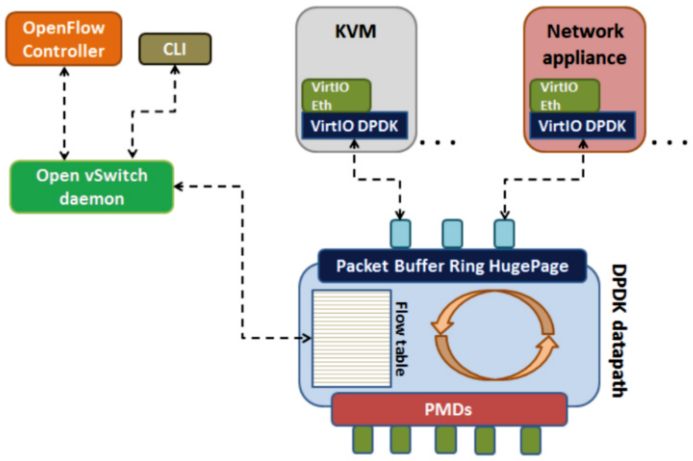
The NFV platform is designed to deploy high-performance virtual network services on commodity servers and automatic centralized VNFs orchestration.

Basic features:

- the library of VNFs that can be dynamically loaded to the desired location in a network;
- high-performance networking stack to provide high-speed communication in network data plane;
- optimized software switch for routing between VNFs;
- optimized hypervisor to accommodate the high-speed network services in a virtual environment;
- centralized control system that let you manage the load of virtual services, set the communication rules between services, monitoring load status of running services.



Pic. 1. The main scheme of the management platform with a pool of network functions and a high-performance networking stack.



Pic. 2. The high performance datapath for the NFV platform

High performance datapath:

- based on Intel DPDK, as a means to high-speed packet processing;
- based on the Open vSwitch;
- integration with SDN / OpenFlow controllers;
- 10-times acceleration of packet processing compared to existing solutions (10Gb channel, 64 bytes UDP packets, l3 forwarding):
  - between the physical ports 10Mpps against 1Mpps
  - between the virtual network services 4Mpps against 0.3Mpps
  - between the physical ports and virtual machines 2Mpps against 0.3Mpps.
- the overall achieved performance for one server is 50Gbps (Intel E3-1240 3.4GHz/8)

The pool of VNFs contains wide range of high performance VNFs:

- CG-NAT,
- URL-Filtering,
- Encryption,
- Signature-based-IDS,
- BRAS,
- Firewall.

Management and orchestration:

- Based on OpenStack cloud management platform.
- Automatic VNF allocation and scaling.
- Integration with high-performance datapath (OpenStack Neutron and Nova plugins).
- Integration with ARCCN OpenFlow controller for fine-grained flow control suited for VNFs chaining.

openstack™

Other products:

1. Optimized Open vSwitch.
2. Accelerated GRE stack for Open vSwitch.
3. Accelerated Neutron networking in OpenStack based on optimized Open vSwitch.

Applied Research Center for Computer Networks (ARCCN) - is a research project for the development of technologies and products for next-generation computer networks in Russia. ARCCN was established in February 2012.

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