SOLUTION DESCRIPTION

NAPATECH VIRTUALIZATION SOLUTIONS
VIRTUAL SWITCH ACCELERATION

The following document provides an outline of Napatech reconfigurable computing solutions for accelerating virtual switching applications, such as Open Virtual Switch (OVS). The solutions are based on Napatech FPGA SmartNICs and supporting software and are designed to provide performance without compromising flexibility. The solutions do not require changes to Virtual Network Functions (VNFs) and OVS.

There are two solutions available. The first solution is based on partial offload of the virtual switch megaflow cache providing a fast-path for data-plane traffic that can greatly improve performance compared to OVS+DPDK and standard NICs. The second solution extends this concept by directly transferring data to the memory of the VNF using DMA channels and virtio. While similar to SR-IOV in concept and performance, it provides a number of advantages, chief of which are that the solution is based on standard mechanisms, does not require changes to the VNF and provides the ability to migrate VNFs quickly and easily.

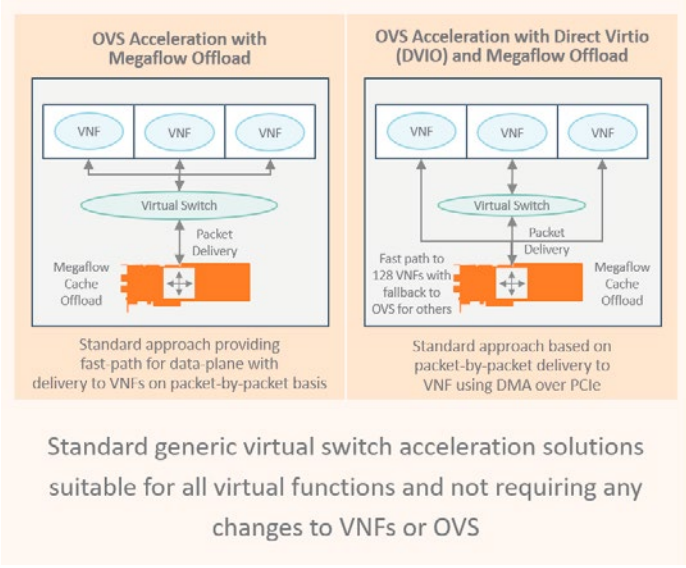

Figure 1: Napatech SmartNIC Solutions for Virtual Switch Acceleration

With these solutions, the number of CPU cores needed to transfer data can be dramatically reduced allowing more revenue generating VNFs, applications and services to be supported.

NAPATECH SOLUTIONS FOR VIRTUAL SWITCH ACCELERATION

The following provides a brief overview of each virtual switch acceleration solution using OVS as an example.

The virtual switch acceleration solutions are based on a reconfigurable FPGA-based SmartNIC where the NIC Ethernet PHY and MAC are defined in the FPGA allowing the same hardware to support multiple physical port speed rates from 1G to 10G, 25G, 40G, 50G and 100G. Additional features can be added on-the-fly through a remote reconfiguration of the FPGA and this can include combining the virtual switch acceleration solution with other solutions such as virtual machine to virtual machine east-west traffic monitoring or hardware offload of functions, such as encryption and compression.

OVS ACCELERATION WITH MEGAFLOW OFFLOAD

This solution is based on a standard OVS+DPDK distribution with the addition of partial offload of megaflows. It allows the megaflow cache in the SmartNIC hardware to be automatically updated when a change is made to the OVS megaflow cache thereby enabling hardware acceleration of north-south and east-west data-plane traffic being switched through OVS. In addition, the solution provides VLAN/VxLAN/NvGRE/GENEVE encapsulation and decapsulation functionality.

The solution is designed for fast integration with minimal impact and does not require any changes to virtual functions.

OVS ACCELERATION WITH DIRECT VIRTIO (DVIO) AND MEGAFLOW OFFLOAD

This solution is based on a standard OVS+DPDK distribution and includes all of the functionality and features of the OVS acceleration with Megaflow offload solution above. Instead of transferring data to VNFs through OVS, a Direct Virtio (DVIO) solution is used.

The DVIO solution is based on a Direct Memory Access (DMA) engine on the SmartNIC that is responsible for transferring data over the server PCIe interface from the SmartNIC to the VNF. This means that no OVS resources are used for switching, which dramatically reduces the CPU load. Up to 128 DMA channels are available for DVIO, which means up to 128 VNFs can be serviced with DVIO acceleration. Additional VNFs revert back to switching via OVS in software.

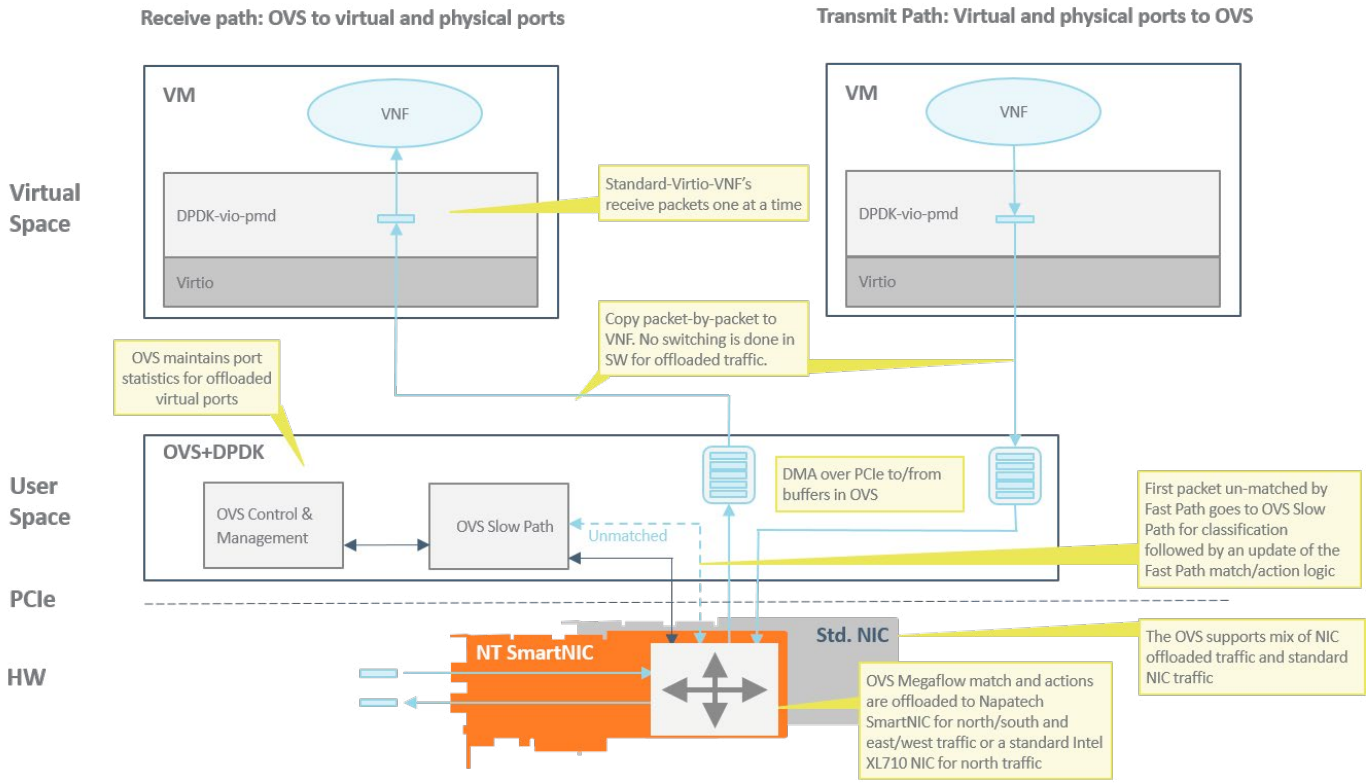

Figure 2: OVS Acceleration with Megaflow Offload

This solution is similar in concept to SR-IOV in that it bypasses the virtual switch in the hypervisor. However, unlike SR-IOV, DVIO does not use the concept of virtual NIC interfaces but relies on the virtio interface, which means that VNFs can be migrated and are not tied to the SmartNIC hardware.

With DVIO, it is possible to deliver 2 ports of 40G traffic to a VNF without consuming any CPU cores with full VNF mobility.

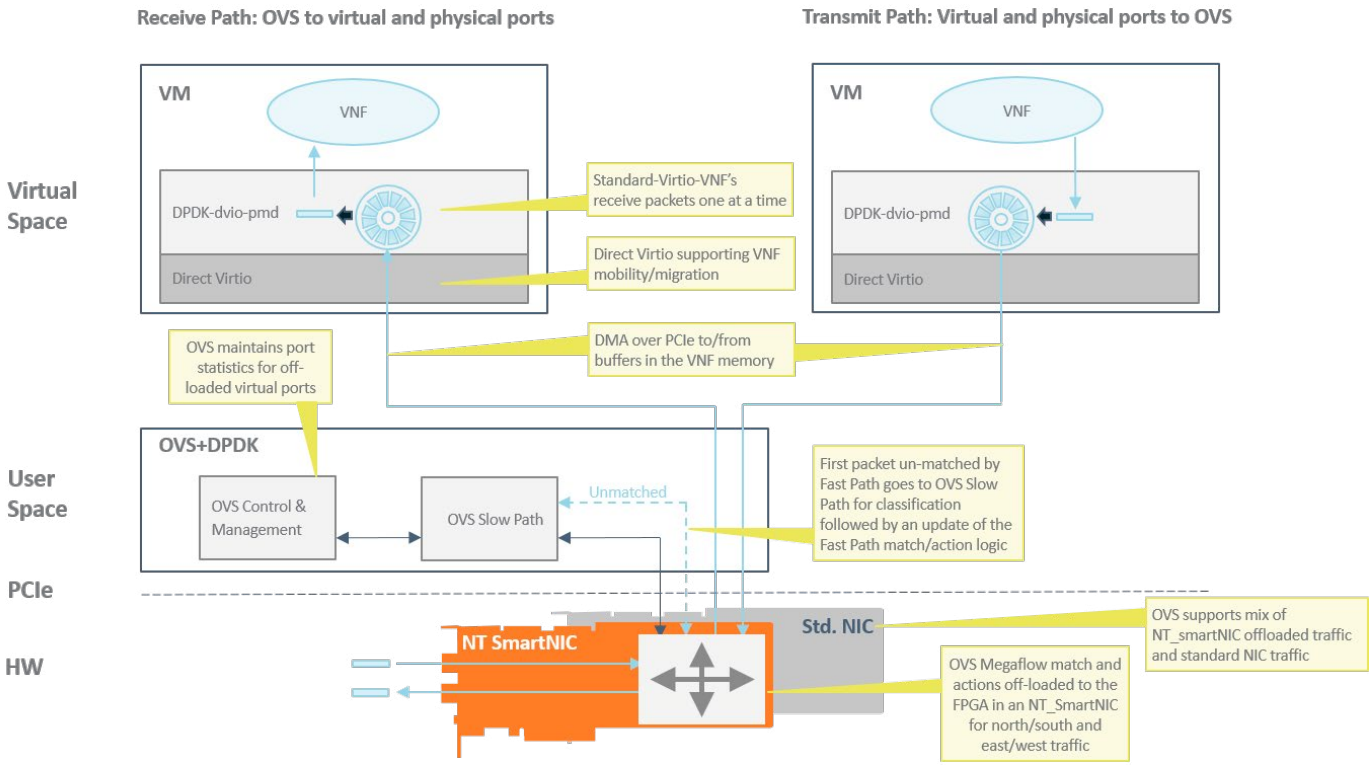

Figure 3: OVS with Direct Virtio (DVIO) and Megaflow Offload

ALTERNATIVE SOLUTION THAT COMBINES PERFORMANCE, FLEXIBILITY AND COST-EFFICIENCY

Napatech's reconfigurable computing solutions for Virtual Switch Acceleration provide an alternative to existing data delivery solutions in virtual environments. As the results show, it is no longer necessary to compromise on performance or flexibility, but possible to achieve both. In addition, the solution minimizes the number of CPU cores required for data delivery to the minimum. This reduces CAPEX and OPEX costs of server resources at the data center level by several million dollars while also providing the opportunity to consolidate virtual functions on as few servers as possible, further reducing OPEX costs.

For more information see our website:
www.napatech.com/solutions/virtualization-solutions

Or contact Napatech for more information:
www.napatech.com/contact

COMPANY PROFILE

Napatech helps companies to reimagine their business, by bringing hyper-scale computing benefits to IT organizations of every size. We enhance open and standard virtualized servers to boost innovation and release valuable computing resources that improve services and increase revenue. Our Reconfigurable Computing Platform™ is based on a broad set of FPGA software for leading IT compute, network and security applications that are supported on a wide array of FPGA hardware designs.

Network Interface Card NT200B01

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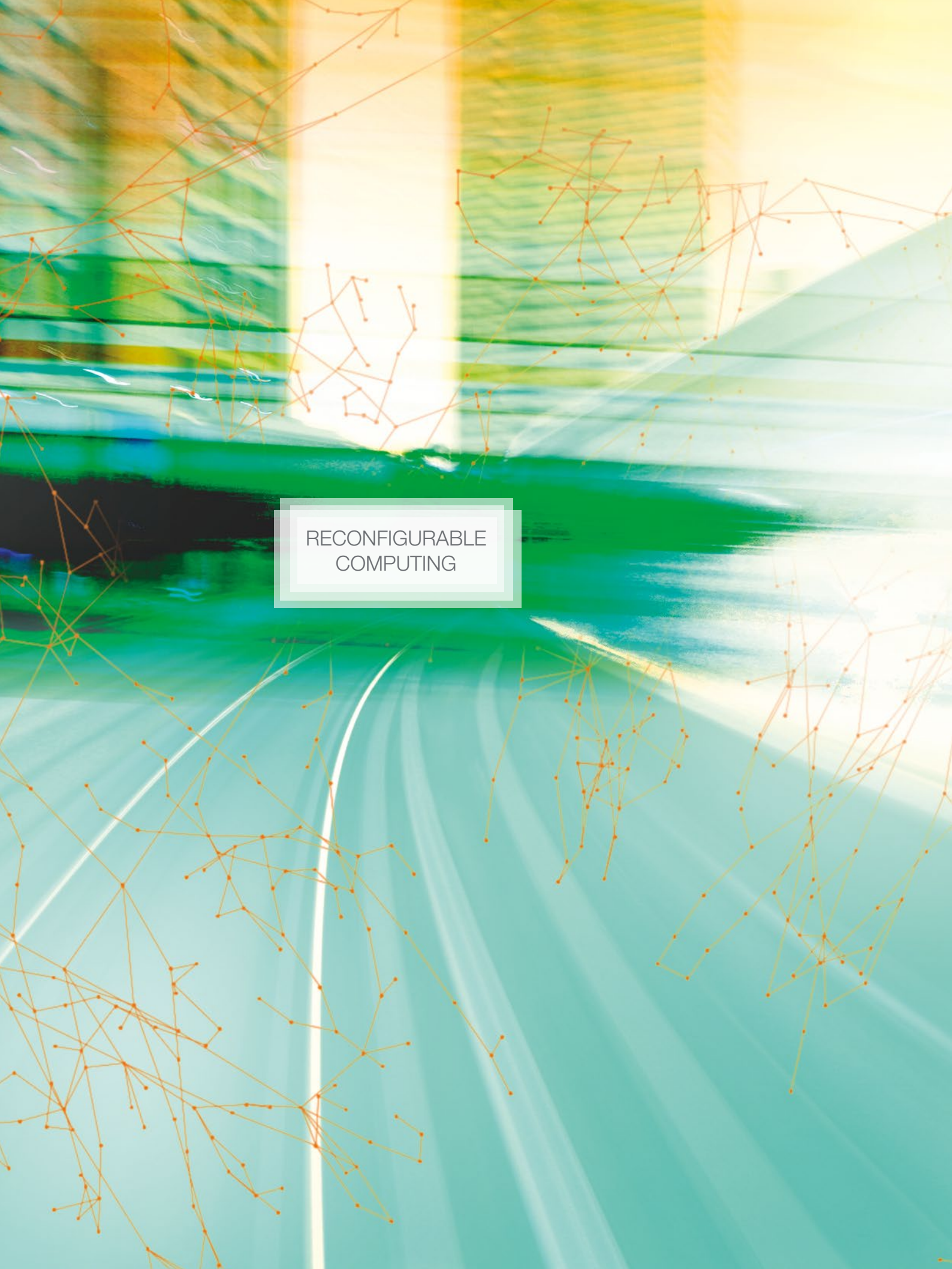
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