Improving Data Center Infrastructure by JaguarMicro DPU

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Why DPU

1GE  10GE  25GE  100GE  200GE/400GE

Server

- Bare Metal
- VM
- Container

Management

- openstack
- kubernetes

Network

- OvS
- DPDK
- SPDK

Storage

- NVMe

Security

- IPsec
- SSL/TLS
- HASH
- Encryption

NIC

- TSO/GRO
- RSS

SmartNIC

- OVS datapath
- TSO/GRO
- IPMe-cf with RDMA
- NVMe-cf with TCP
- RDMA
- Encryption

DPU

- Management
- Network
- Storage
- Security

- IPsec
- SSL/TLS
- Encryption

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• As demand for big data and network bandwidth explodes, data center can’t rely only on CPU to handle all workloads.
• All future data center infrastructure workloads (network, storage, virtualization, management) will be handled by data processing units (DPUs).

DPU becoming the “controller” of next-gen data center
A leading technology company developing a new generation of DPUs and advanced silicon solutions for modern data centers. Founded by Dr. Sunny Siu and a core team each with over 20 years of experience in the semiconductor industry, the company has gathered a world-class silicon and software team formerly from Broadcom, Intel, Arm, HiSilicon (Huawei), and Alibaba.
### Challenges in Data Center

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<th>Unified Management</th>
<th>Hot Migration</th>
<th>Elastic Cluster</th>
<th>Flexibility</th>
<th>Compatibility</th>
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<td>How to unify the management of VM, Container and Bare Metal services</td>
<td>Offloading Network, Storage, Management workload from Host CPU to DPU makes VM Migration more complex</td>
<td>How to support elastic cluster resource management for VM, Container and Bare Metal services</td>
<td>How to achieve programmability with performance acceleration</td>
<td>How to ensure minimal disruption to existing systems</td>
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JaguarMicro DPU combines 3 chips 'functionalities into an SoC

- 3 chips solution, very expensive
- Power exceeding 150W
- Cannot reach 2*100Gbps+

- Single chip solution reducing cost & power each by over 50%
- Multi-fold increase in performance.
FPGA-based JaguarMicro DPU solution already in production

Features

✓ Unified support of Bare-metal, VMs and Containers services
✓ 2x25G network support and high-performance storage
✓ Enable elastic and on-demand virtual network and storage interfaces
✓ Support hot migration, hot upgrade, and hot pluggable
✓ Allow smooth migration from standard NIC card to FPGA-based DPU
Bare-metal, VM & Container service support

Unified Management and Single Pool for BM, VM and Container
Kebernetes Solution

**Bare Metal**
- Kube-apiserver add and configure virtio-net and virtio-blk devices to bare-metal host.

**Container**
- Kube-apiserver create | delete | manage pods through kubelet on work node.
- Kubelet talks with DPU through CNI/CSI plugin to add and configure virtio-net and virtio-blk devices.

**Virtual Machine**
- Kube-apiserver create | delete | manage VMs through kubelet & Virt-launcher & Virt-handler on work node.
- Kubelet talks with DPU through CNI/CSI plugin to add and configure virtio-net and virtio-blk devices.
Openstack Solution

Bare Metal
- By libvirt on DPU, Nova, Cinder and Neutron agents add or configure virtio-net or virtio-blk devices.

VM
- By libvirt on DPU, Nova, Cinder and Neutron agents add or configure virtio-net or virtio-blk devices.
Software Architecture

Applications

- AI
- Big Data
- Database
- NFV
- Infrastructure Management
- Software-defined Networking
- Software-defined Storage
- Software-defined Security

IaaS (Baremetal | Virtualization | Container)

JaguarMicro Cloud-native DPU SDK

Cloud Services
- Kubernetes
- Openstack
- Libvirt

Networking
- Security
- Hypervisor
- DataDirectPath
- Telemetry

HAL
- Virtio
- SRIOV
- NVMe
- RDMA
- …

DPU Hardware Platform
- FPGA
- SoC

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On DPU with DDPS enabled, AI Unit (like DTU) or GPU can access remote storage bypass Host, getting lower latency and higher performance.
Highlights

**Network**
- Hardware Accelerator
- Compatibility
- C programming

**Storage**
- Hardware offload
- Compatibility
- DataDirectPath Storage|RDMA

**Security**
- Zero Trust
- Hardware Accelerator

**Management**
- Unified Infrastructure Mgmt
- VM Migration
- Hot Upgrade
- Diskless Boot
- Hot Plugging
Addressable Markets

- Offloading infrastructure workloads from server CPUs
- Support and unify management of Bare-metal cloud service
- Support multi-level SLA for cloud-native applications
- Private cloud and Enterprise applications (edge computing, control plane etc)
- Support NFV for telecom and 5G operators
THANKS!

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