High performance Cloud with Hardware Acceleration

Cloud BU, Huawei

Huawei Cloud Architecture

The world is changing - more devices, more conns, more data

Billion

Tens of Billions

100 ~ 1000 of Billions

Desktop Internet

The PC brought the internet access to billion, during the 1990s

Mobile Internet

The Mobile Revolution put computing and instant access to information in the hands of billions, in the early 2007s

Internet of Things

Now!

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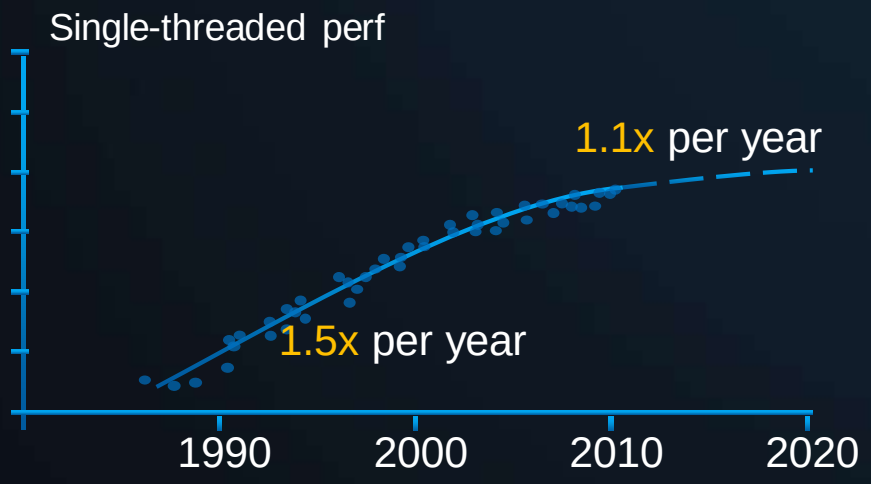
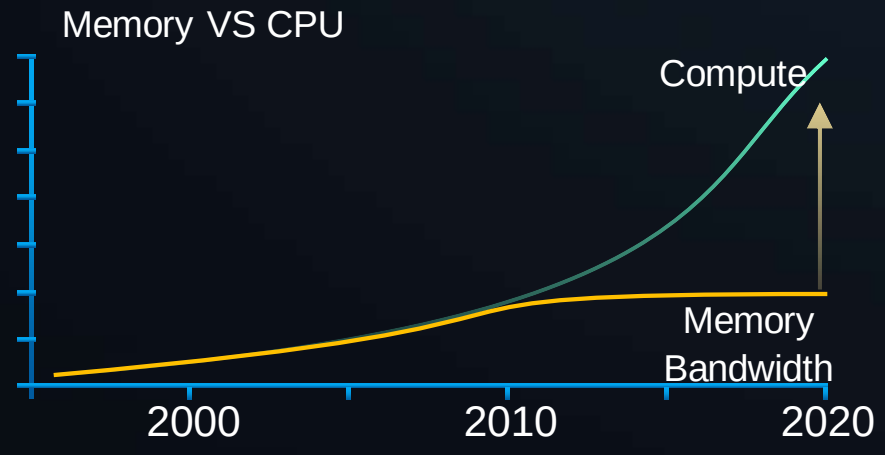
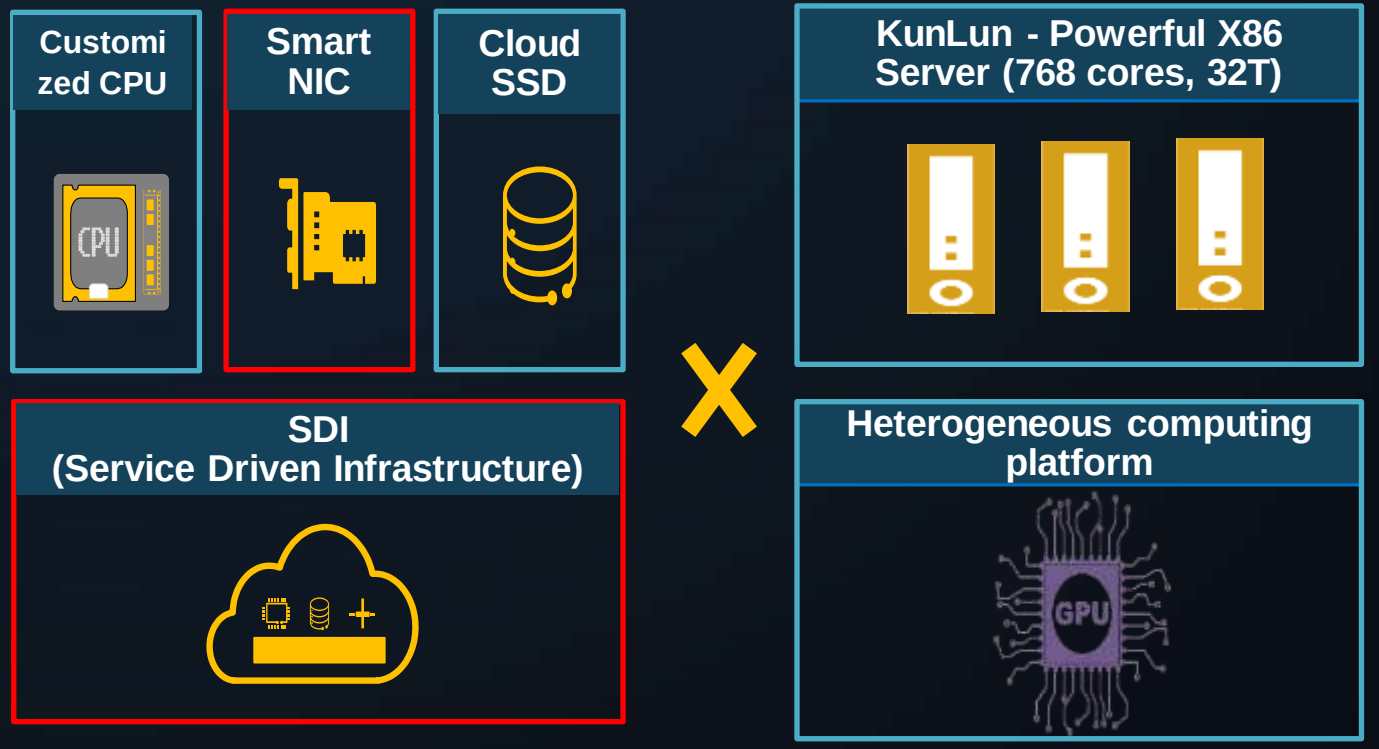
Moore’s law is slowing





Keeping Moore’s law alive in Data Center



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Smart NIC

Under the hood: Network Virtualization

Host-based SDN:

separate a centralized control plane from a data plane on the host, and implement almost all virtual networking features, to connect VMs to physical network

vSwich is most important

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History of Huawei eVS

eVS – Elastic Virtual Switch

eVS 1.0

- Start from 2013
- Kernel-based OVS
- Enhanced features (CT/BUM)
- 8Gbps/900Kpps

Limited by Kernel

eVS 2.0

- Start from 2015
- DPDK
- General Packet Filtering Platform
- Optimized SIMD and Multi-threaded scheduling
- 20Gbps/5Mpps

Limited by CPU frequency, memory bandwidth

How to break the bottleneck of vSwitch?

Our way:
Combination of software and self-developed hardware

And additional benefits:
flexibility, high performance, low cost, high availability

eVS 3.0 - First Tens of Millions PPS virtual network switch

40Gbps 10Mpps

Smart NIC Offloads

Virtio-Direct

Hot upgrade

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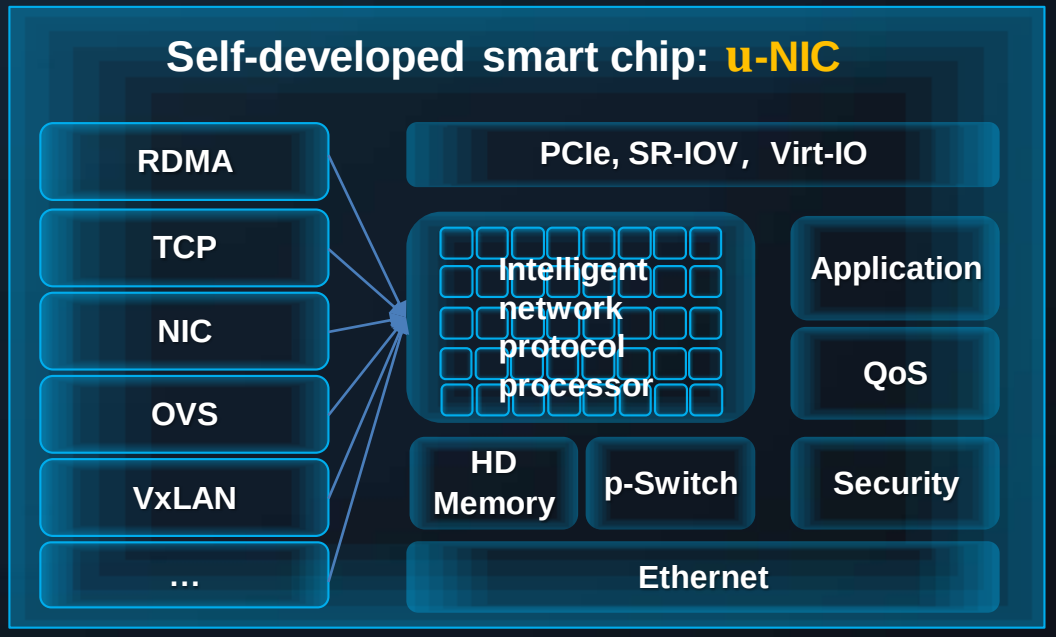
Huawei Smart NIC: u-NIC



Features

- Programmable high performance packet forwarding platform
- Network-specific optimization engine （PPE）
- Large flow table and security rules
- High precision hard QoS

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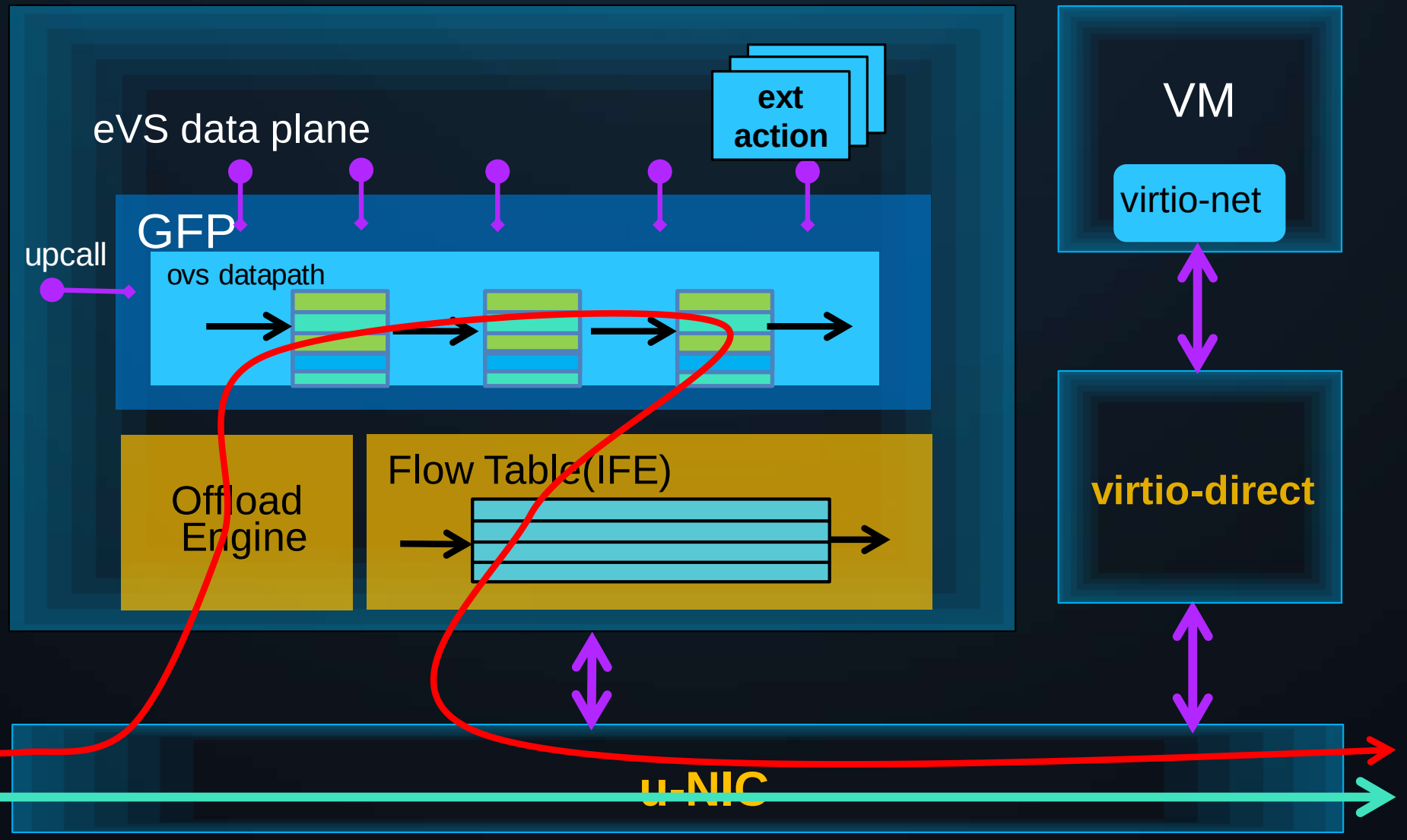
Architecture: Integrated Flow Table and Offload



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Virtio-Direct: Virtual I/O

- **High performance virtio data path**
  Offload virtio head
  Zero Copy
  IRQ Aggregation

- **High Availability, Smooth migration**
  Standard virtio-net
  Non-intrusive GuestOS
  Support Live migration

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Hot upgrade, both Hardware and Software

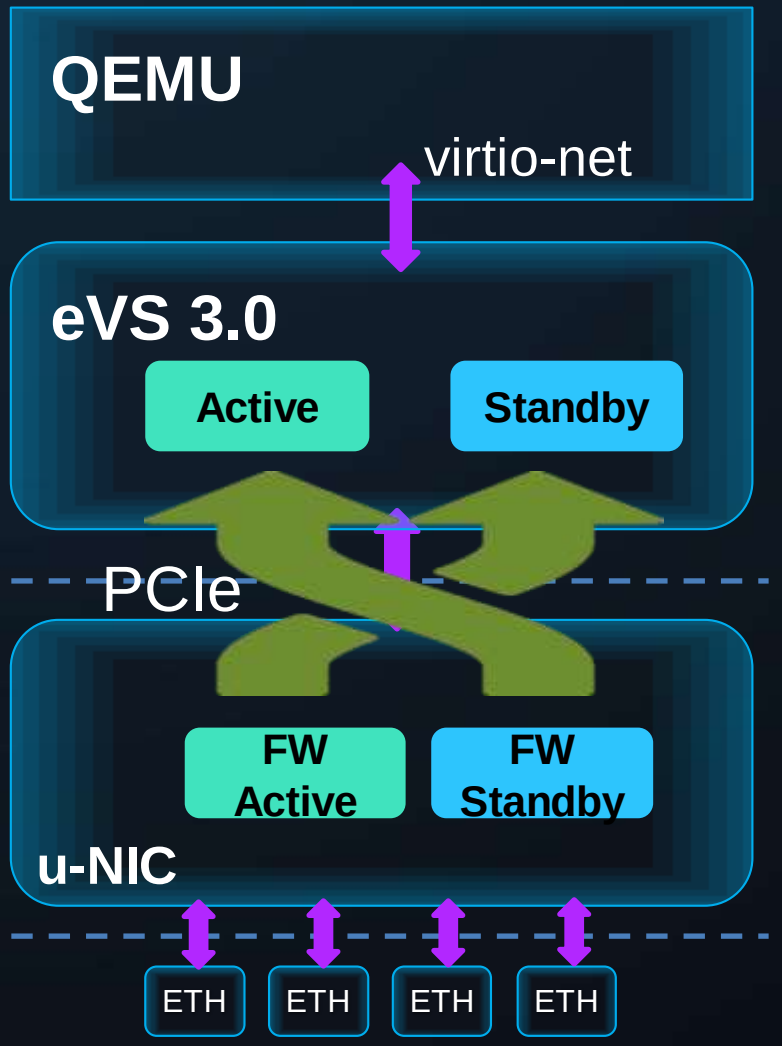
No user impact

Active/Standby Mode

Hot upgrade/downgrade

Independent hot upgrade

Joint hot upgrade



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Flexibility, Performance, Availability

	Virtio-Direct	Other Smart NIC SR-IOV
Virtual I/O Mode	Software & Hardware	Hardware
Performance	✓	✓
Non-intrusive GuestOS	✓	✗
Live migration	✓	✗
Hot upgrade	✓	✗

SDI

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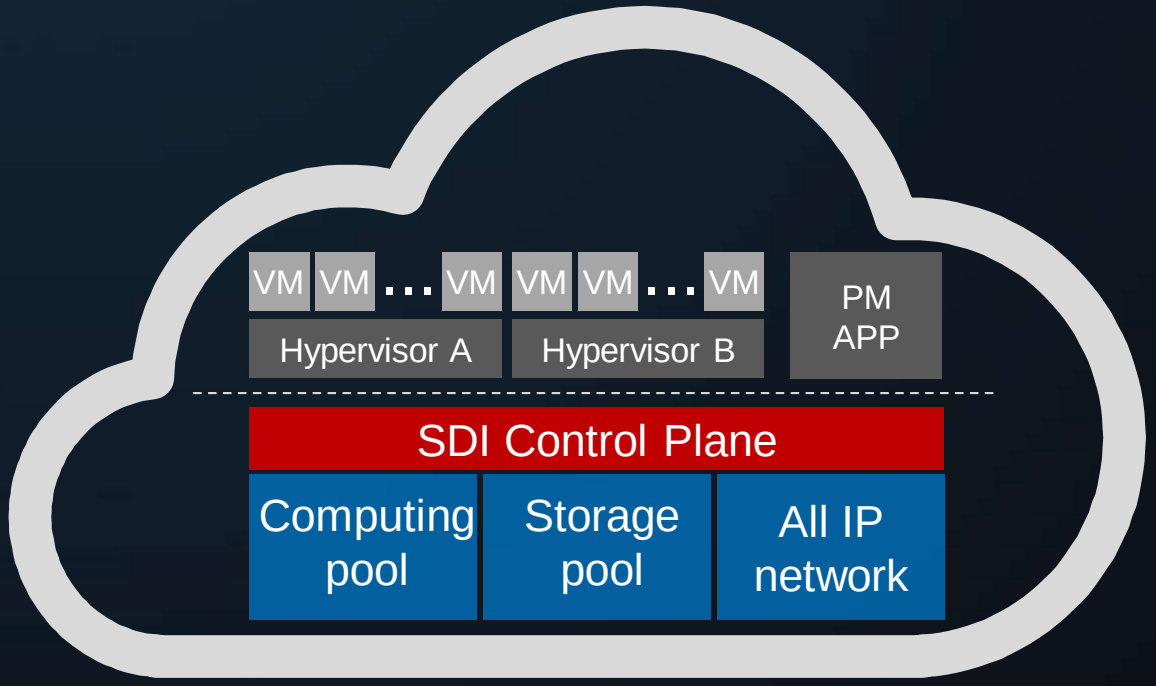
SDI

- Release more CPUs to user
- High perf on basic services: storage and network
- Based on self-developed chip



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SDI

- **Resource Competition**
- **20+% Cores wasted**
- **Weak reliability**

- Resource isolation
- 100% Cores for users

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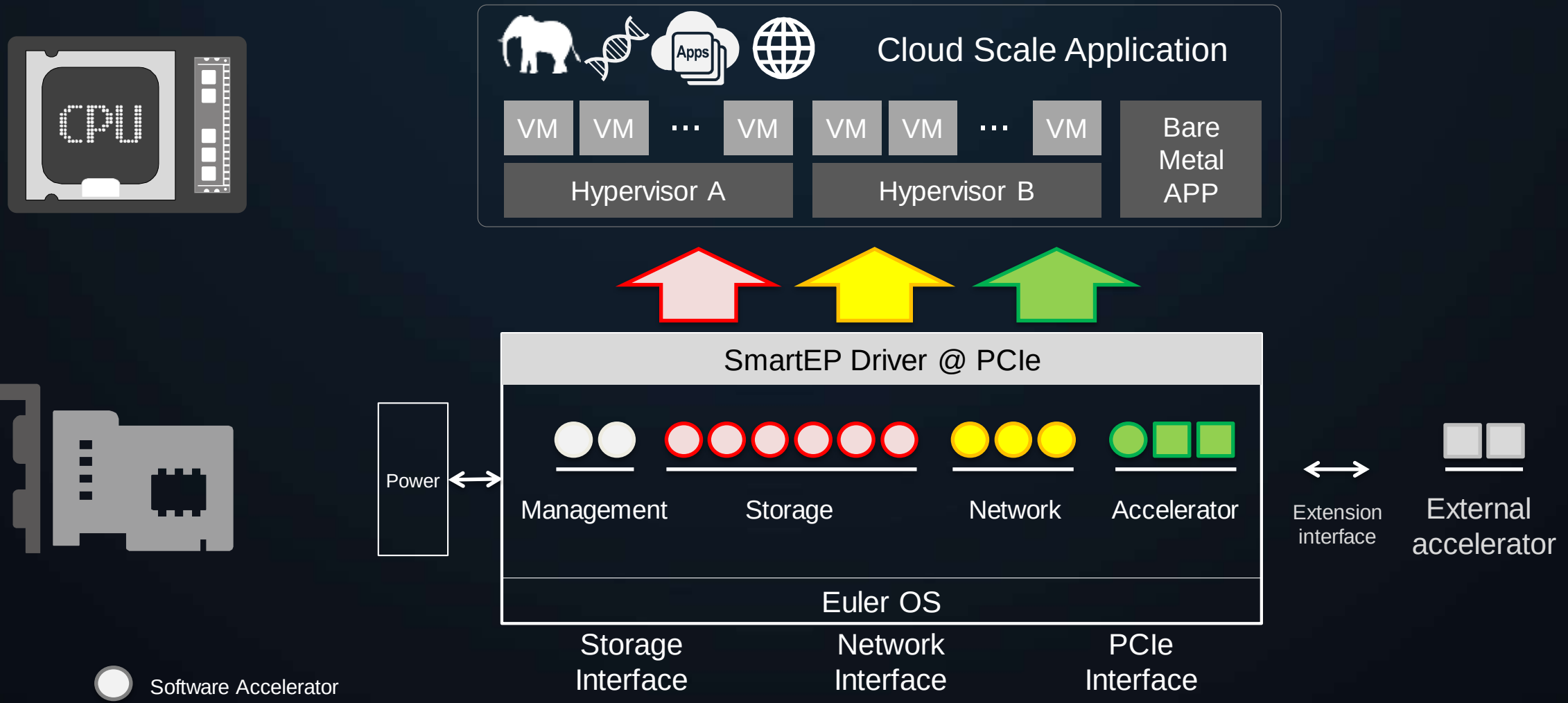
SDI Architecture



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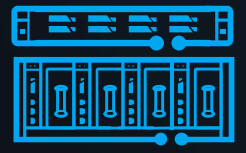
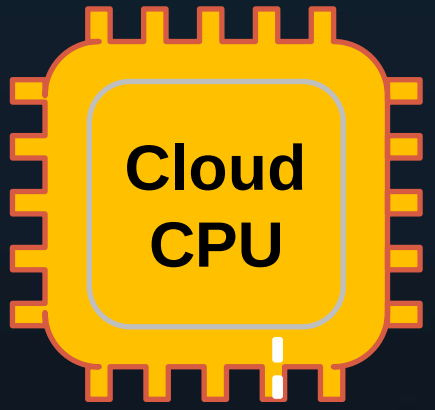
Customized CPU

Application



Customized Server

Data Center



- Single Core Integer 25%↑*
- Single Core Linpack 70%↑*
- Memory Bandwidth 62%↑*

↑*:6151 vs 2680v4

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C3ne - with u-NIC, Virtio-Direct, SDI

General Network Enhancement C3ne ECS NEW

Latest-generation Intel Xeon SkyLake CPUs and high-speed smart Hi1822 NICs offer powerful and stable computing performance, ultra-high network bandwidth, and high Maximum PPS

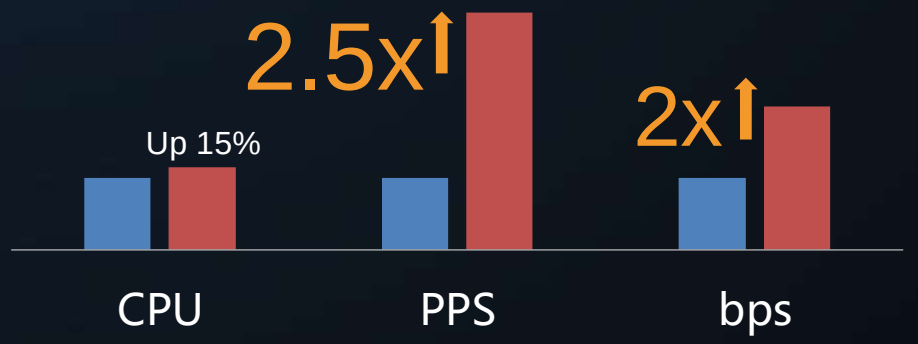
Applications:

High Maximum PPS scenarios, such as on-screen video comments and telecom business forwarding
Enterprise-class applications with high network requirements
Small-and medium-sized databases, cache, and search clusters
Data analysis and computing

Specifications:

CPU/Memory ratio	**1:2/1:4**
vCPUs	**2-60**
Fundamental frequency/Turbo Boost	**3.0/3.4 GHz**
Maximum PPS	**10,000,000**
Maximum intranet bandwidth	**40 Gbit/s**

C3ne



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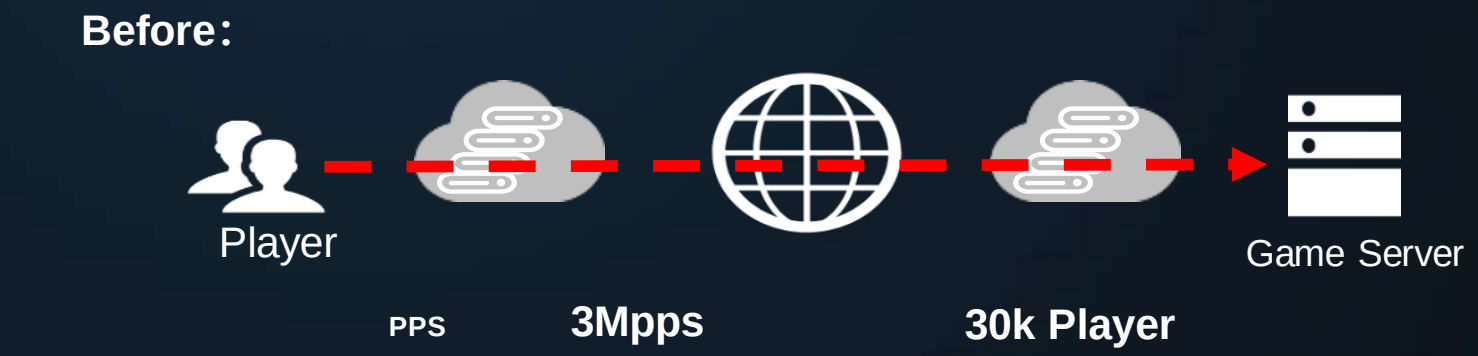
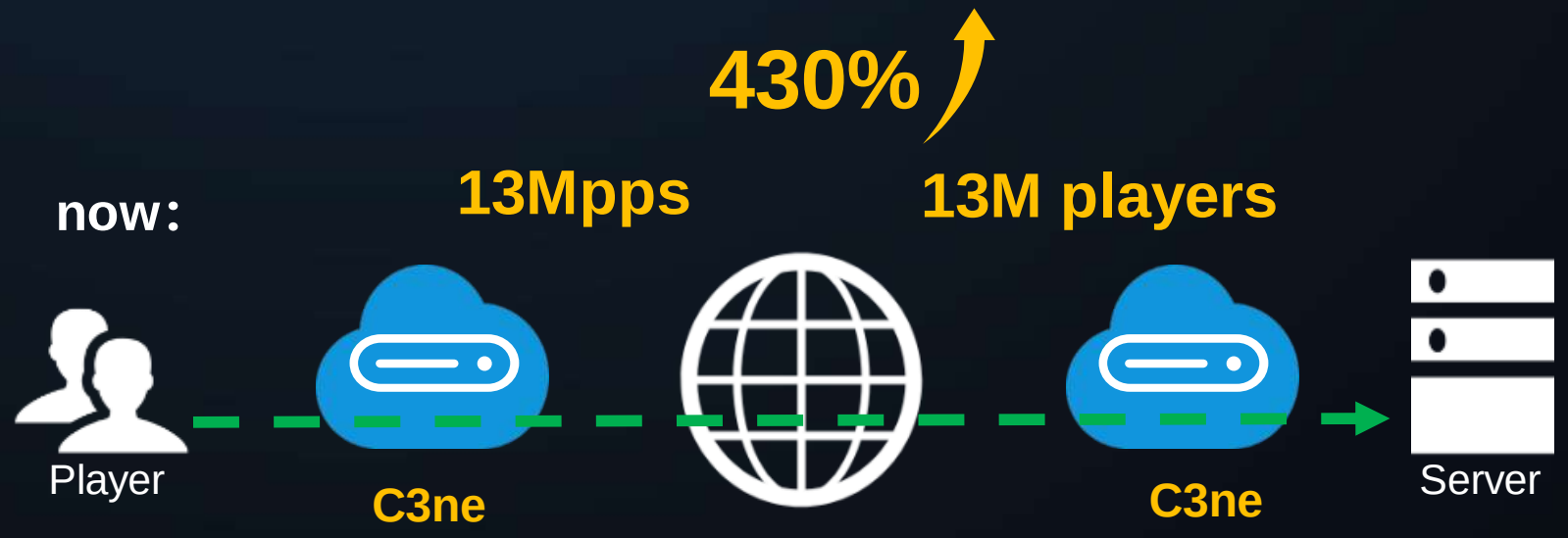
Simultaneous online players from 30k to 13M

- The first listed company that offers game-accelerating services in the world.
- lower ping, no packet loss, no login failure





Thanks