VM Live Migration Powered by Intel® QAT and SVM Technology

Yi Wang Intel Cloud Systems Architect

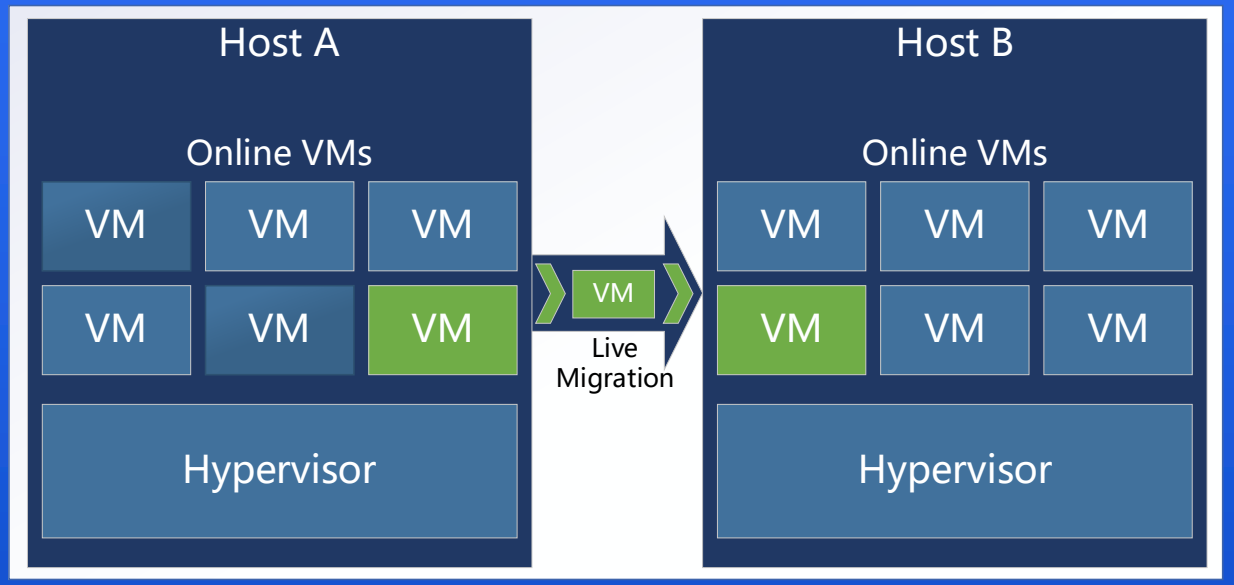
Wang LiMin xFusion FusionOS Senior Technical Specialist

开放原子开源基金会 OPENATOM FOUNDATION | OpenEuler

Agenda

- Concept and challenges of VM live migration
- Intel® technology QAT & SVM
- VM live migration accelerated by QAT and SVM
- Performance data
- Typical use cases of VM live migration

Concept and Challenges of VM Live Migration



VM Live Migration: move a VM running on one host to another without disrupting normal operations

Challenges:

- Generate heavy traffic on network
- Take a long time to complete VM memory transmission for large VMs
- Difficult to complete VM memory transmission for VMs with write-intensive workloads

Typical Use Cases of VM Live Migration

VM live migration is a crucial virtualization technique widely applied in data centers and cloud computing environments.

Load balance

When the physical server is overloaded, it is possible to migrate the running VMs to another physical server to avoid service interruption and ensure the normal operation of the business.

Software upgrade

Upgrading the server's system software may involve machine rebooting. In such cases, it is advisable to first migrate the VMs to other servers.

Hardware maintenance

When the hardware components of a physical server, such as CPU, memory, and hard disk, become bottlenecks, it is necessary to replace them with higher-performance hardware or add additional devices.

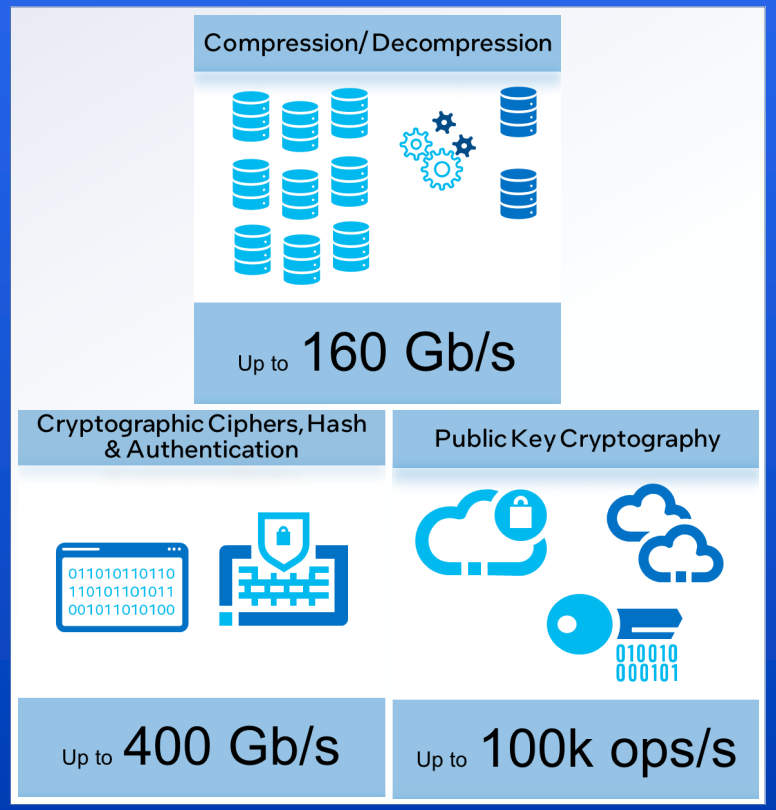
Power management

When the majority of physical servers are underutilized, it is possible to consolidate VMs to reduce the number of physical servers, decrease power consumption, and enhance resource utilization.

Intel® Technology QAT & SVM

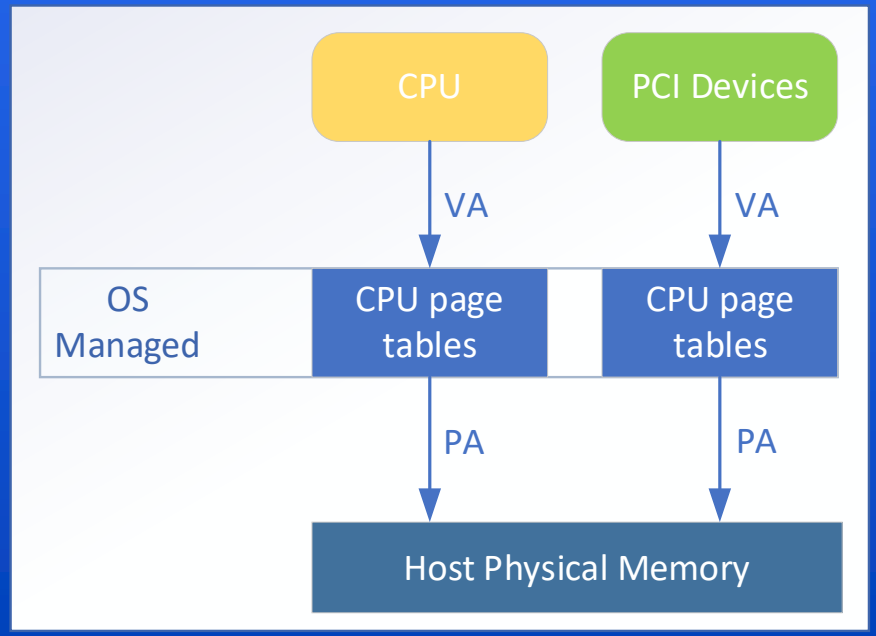
QAT (Intel QuickAssist Technology) Gen 4

- Accelerator embedded in 4th and 5th Gen Intel® Xeon® CPUs



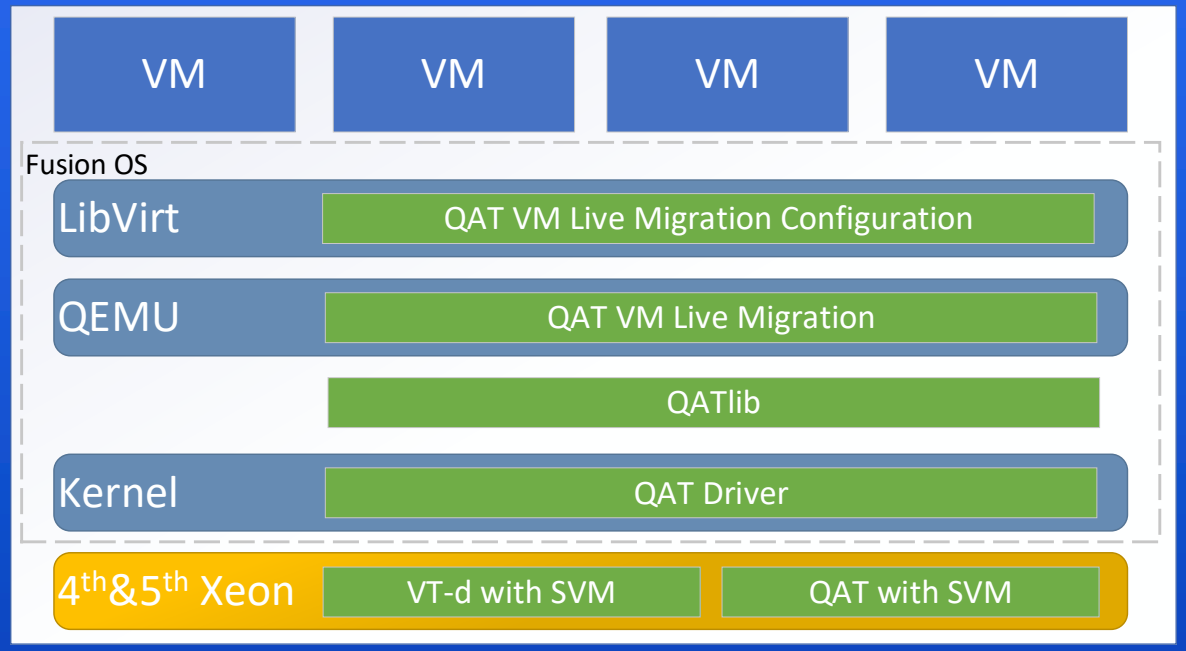
SVM (Shared Virtual Memory)

- Allows processors or devices to access the same virtual memory space



VM Live Migration Accelerated by QAT and SVM

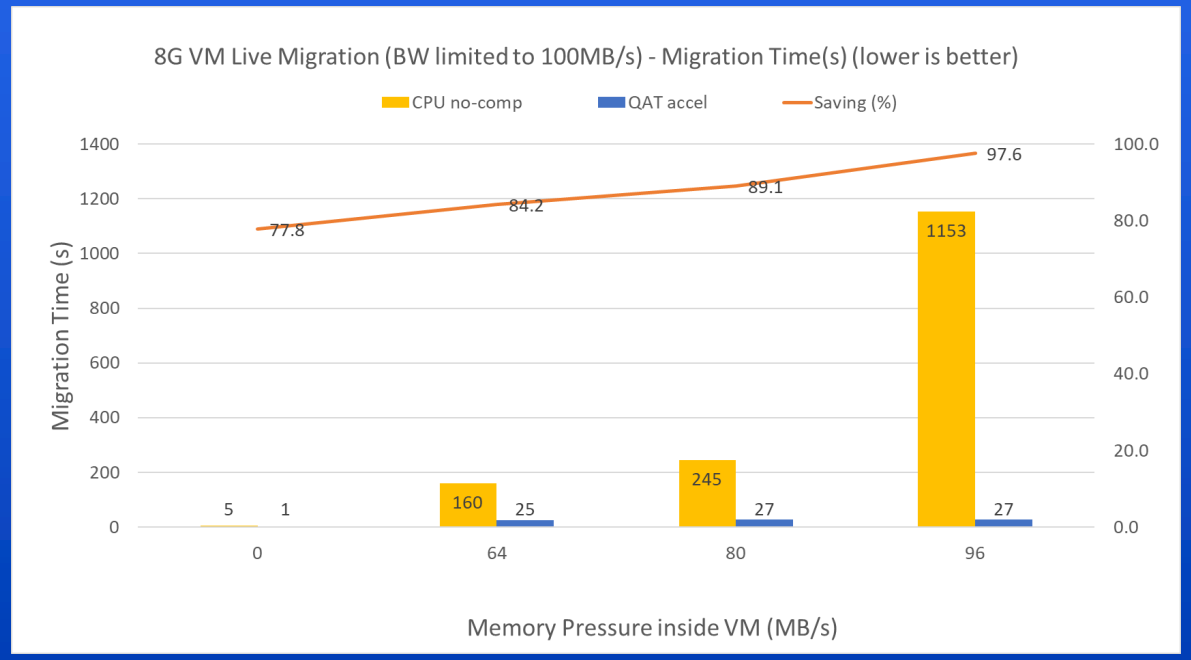
Offload VM memory comp/de-comp into QAT

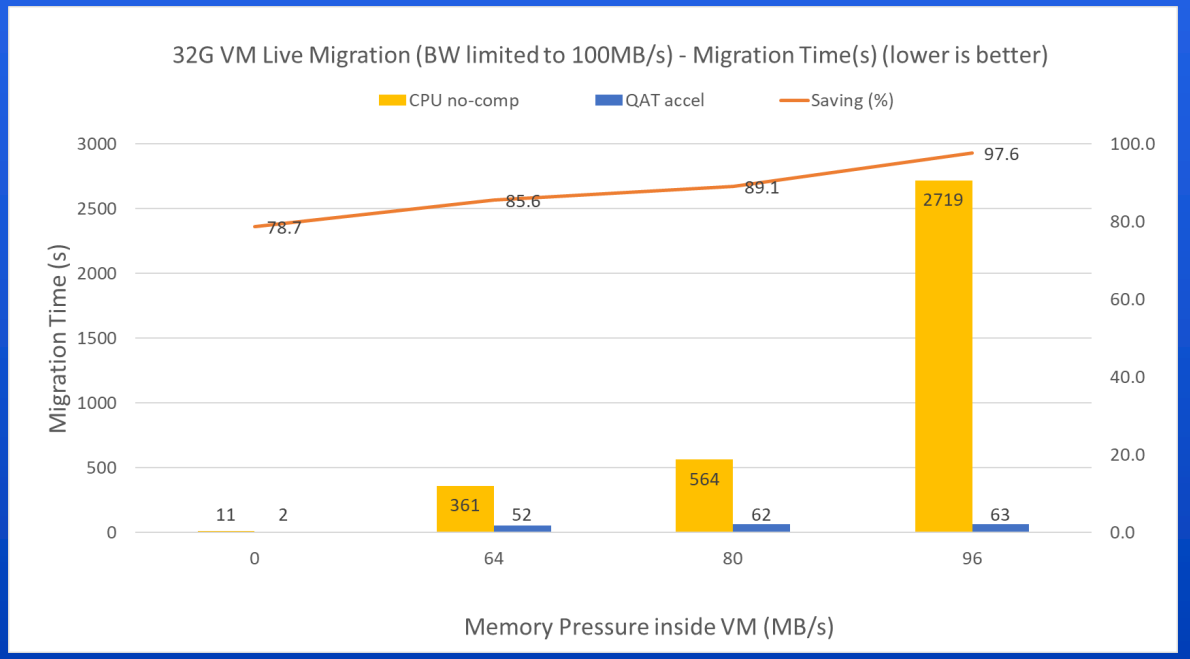


- Asynchronous architecture
- Multiple pages aggregation
- Direct VM memory access

Performance Data

Test configuration	
Platform	5th Gen Intel® Xeon® CPUs with QAT
OS	FusionOS
VM Size	8G and 32G
Bandwidth	Limited to 100MB/s by QEMU configuration





See backup for workloads and configurations. Results may vary,

THANKS

Test Configuration

BASELINE: 2-node, 2x INTEL® XEON® GOLD 6554S, 36 cores, HT On, Turbo On, NUMA 4, Integrated Accelerators Available [used]: DLB 8 [0], DSA 8 [0], IAA 0 [0], QAT 8 [2],Total Memory 256GB (16x16GB DDR5 4800 MT/s [4800 MT/s]), BIOS 3B05.TEL4P1, microcode 0x21000161, 2x Ethernet Controller X710 for 10GBASE-T, 2x Ethernet Controller E810-C for QSFP, 1x CDC Ethernet interface, 1x 1.7T INTEL SSDSC2KB019T8, 1x 447.1G INTEL SSDSC2KB480G8, 1x 1.8T INTEL SSDPE2KX020T8, FusionOS 23, 5.10.0-136.49.0.127.u86.fos23.x86_64, Qemu6.2 with QAT patches, qat20.l.1.1.20-00030_emr_pc_pre_release_rhel, Memory dirty tool, gcc (GCC) 10.3.1, GNU ld (GNU Binutils) 2.37, ldd (GNU libc) 2.34, Tested as of 11/03/23.