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Live Migration @Alibaba Cloud: issues settled & challenges remain

Chao Zhang
Email: zhuoxi.zc@alibaba-inc.com

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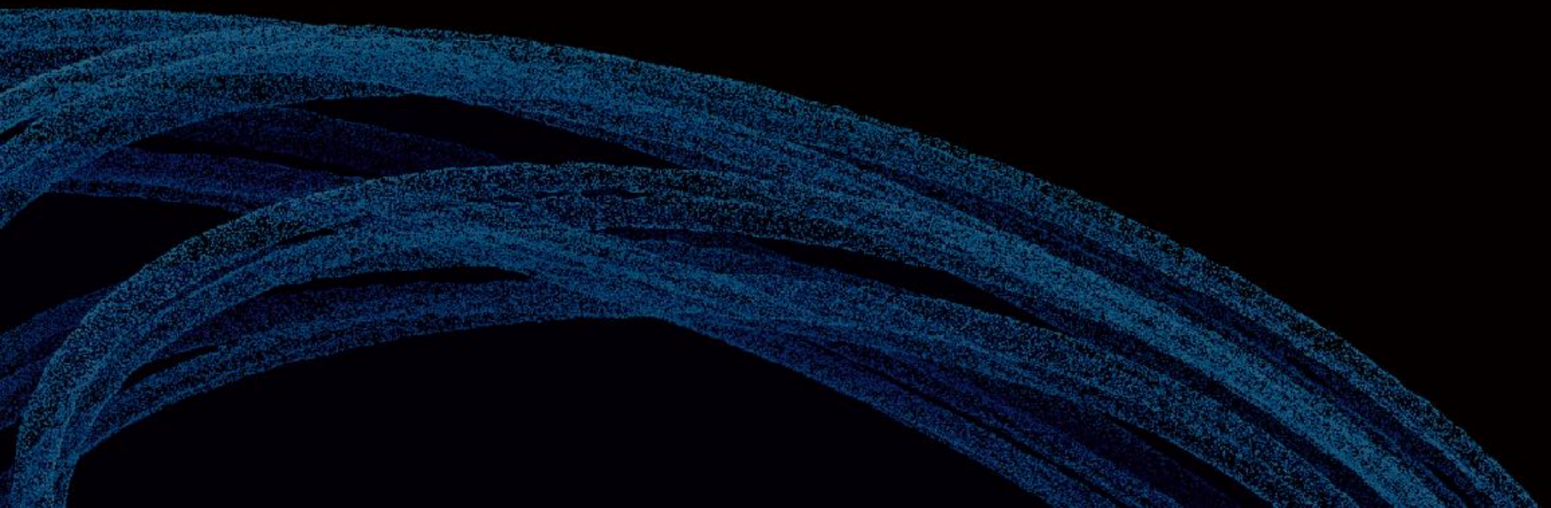
1 Challenges of Live Migration @Alibaba Cloud

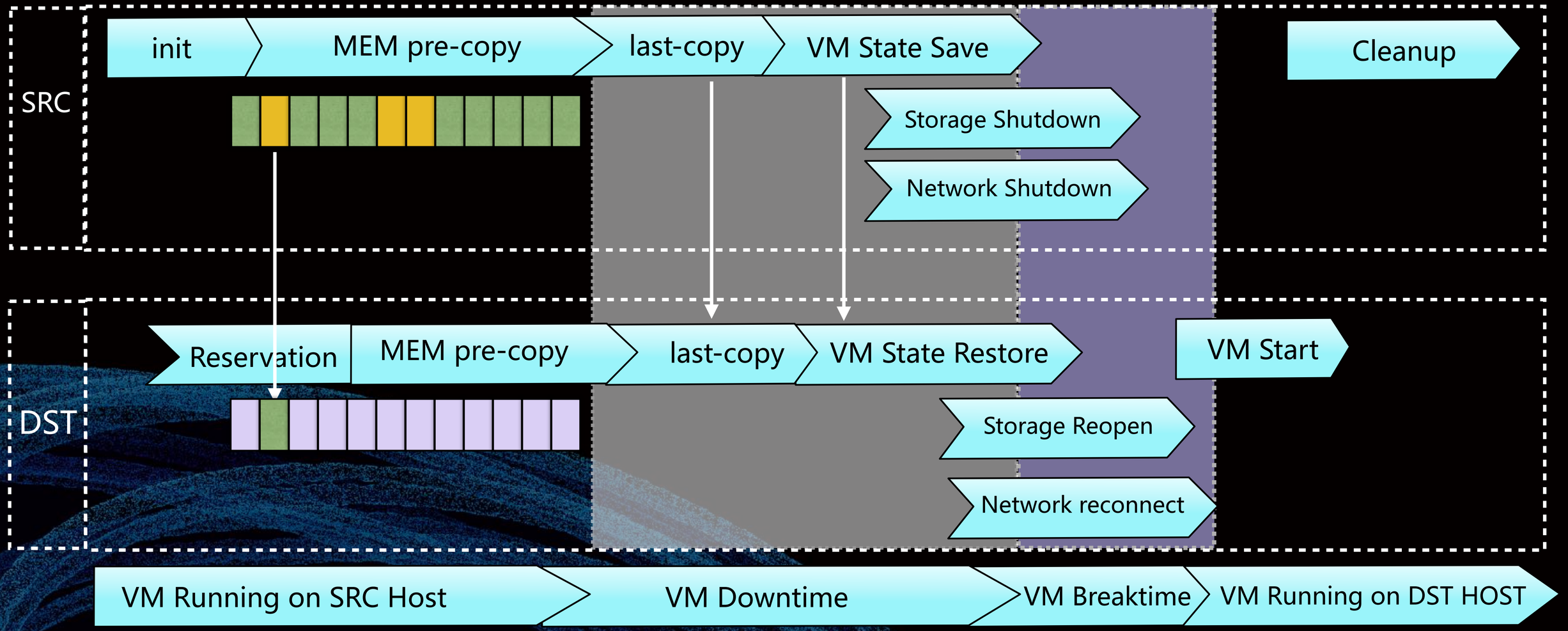
2 Performance Tuning & Robust Improvements

3 LM Application@ Alibaba Cloud

4 Future challenges



Traditional Live Migration in Virtualization



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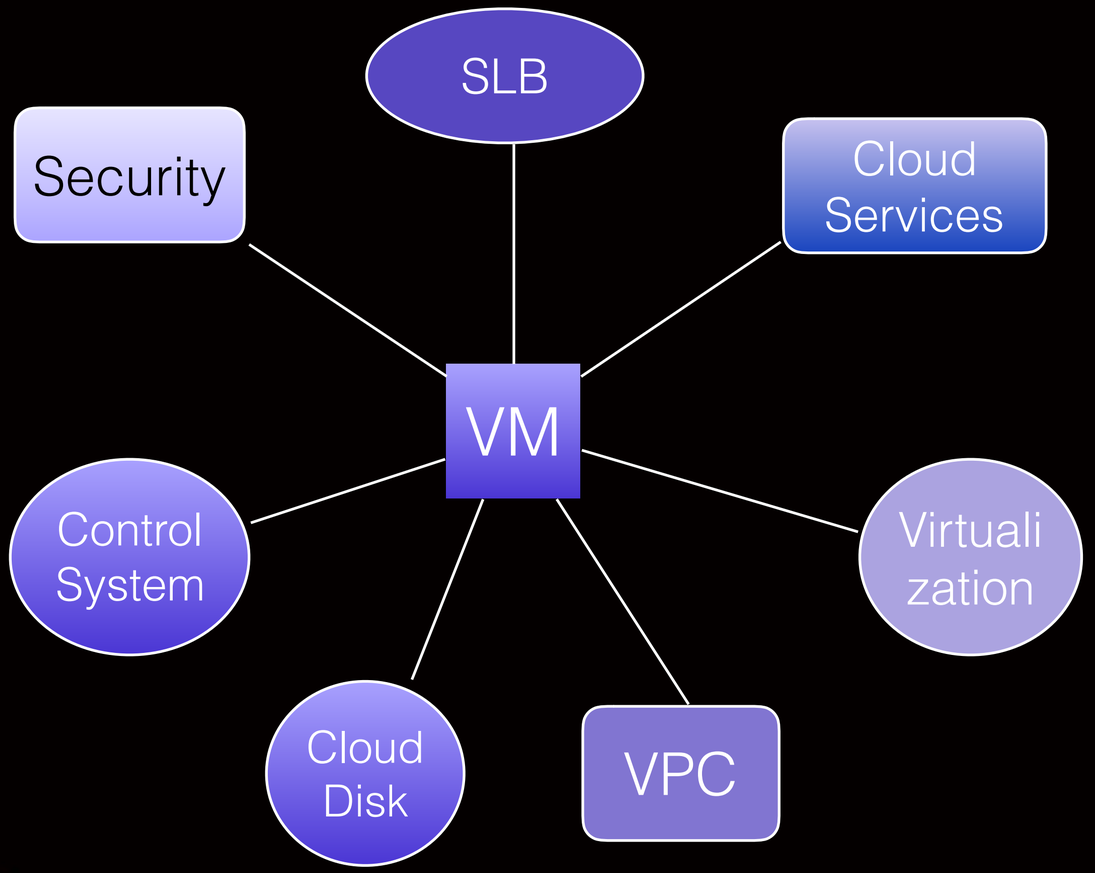
Challenges of Live Migration @Alibaba Cloud

- Require transparent migration to the whole cloud system
- Hardware & Software backward compatibility
- Robust of live migration
- Why/When/Which?



Not Just a Virtualized Instance Migrating

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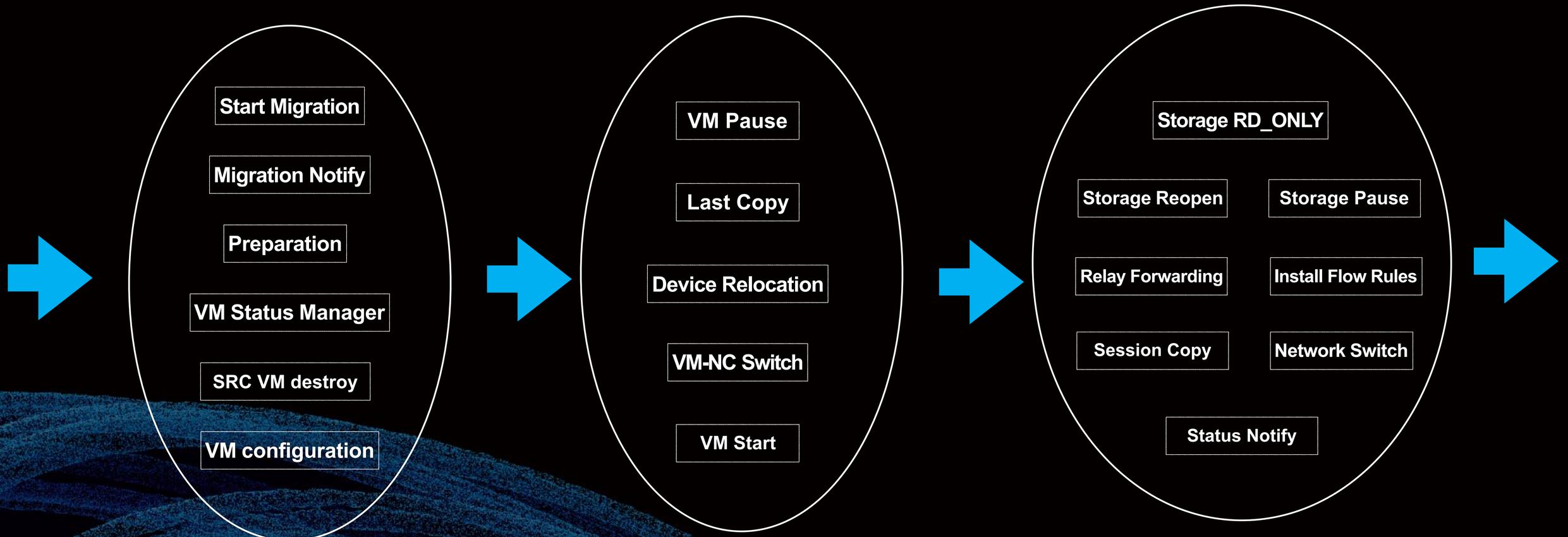
Migration Operations Required @Alibaba Cloud



Control Plane

Virtualization Plane

Other Cloud Services

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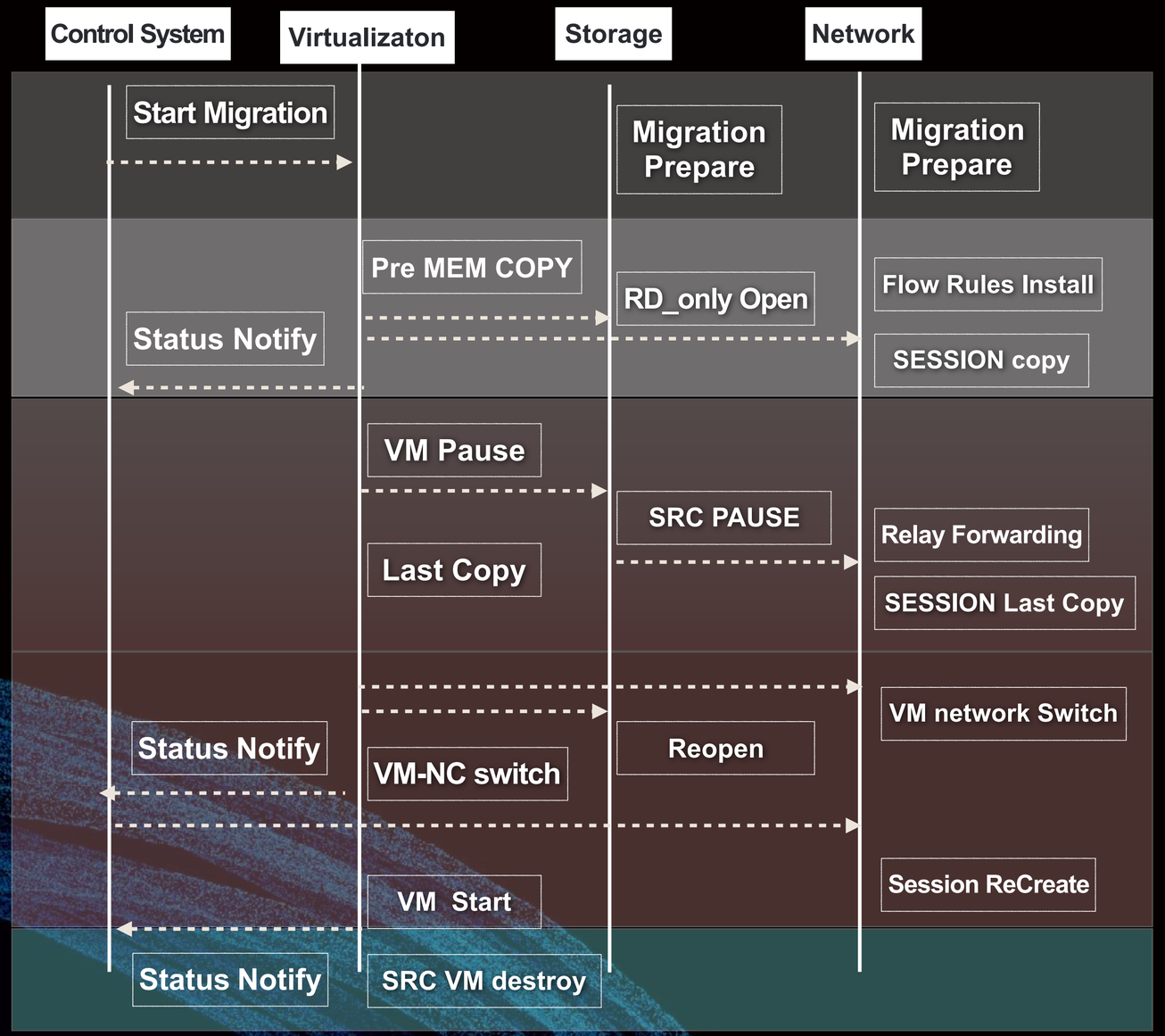
Decoupling Migration by Define Status Entrance Standard



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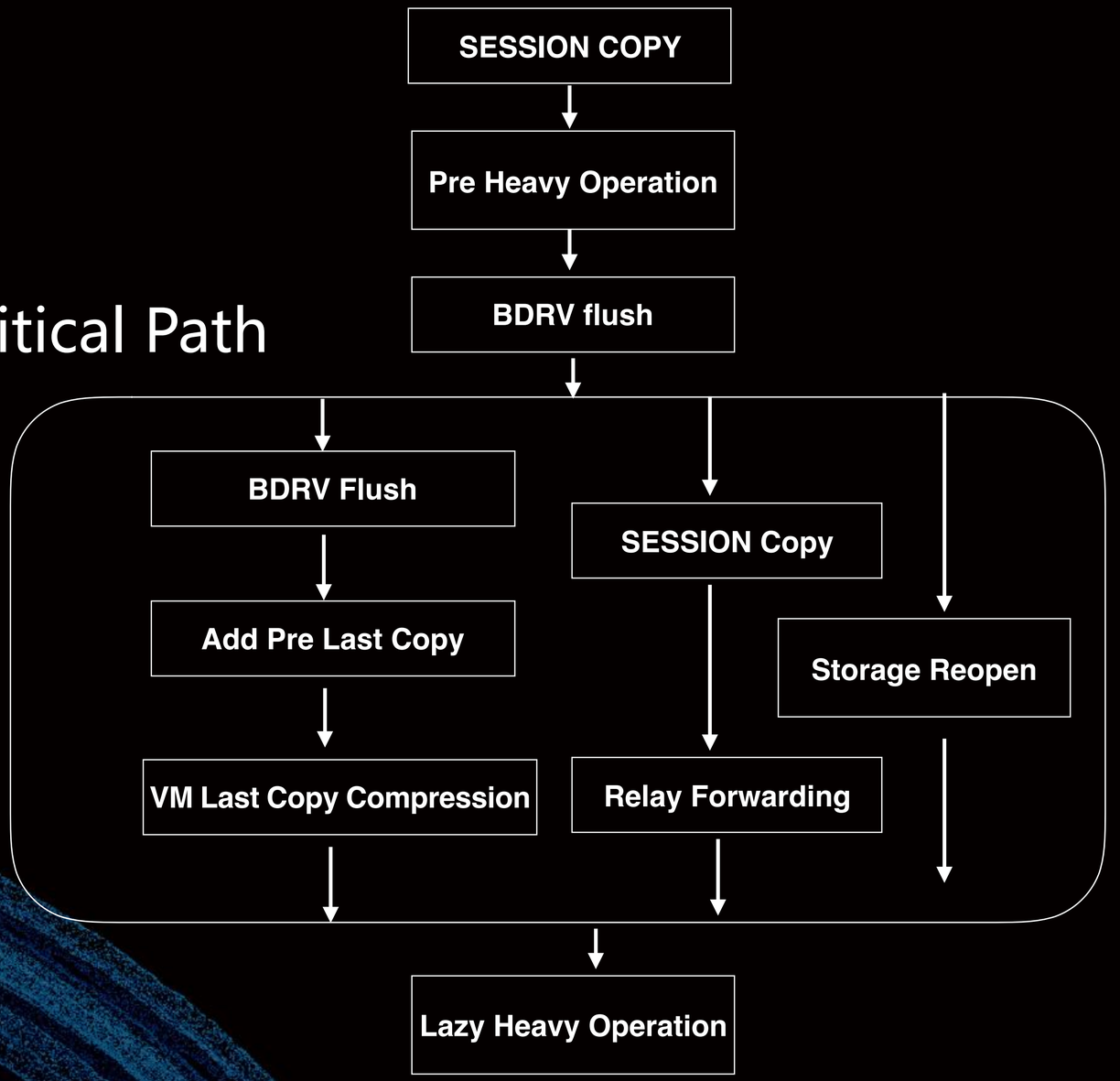
Optimization of Live Migration in Virtualization

- Critical path parallelism
- Dismantling heavy operations
- Rearrangement: Lazy/Pre
- Downwards time-sensitive operation from control system to virtualization plane

Critical Path



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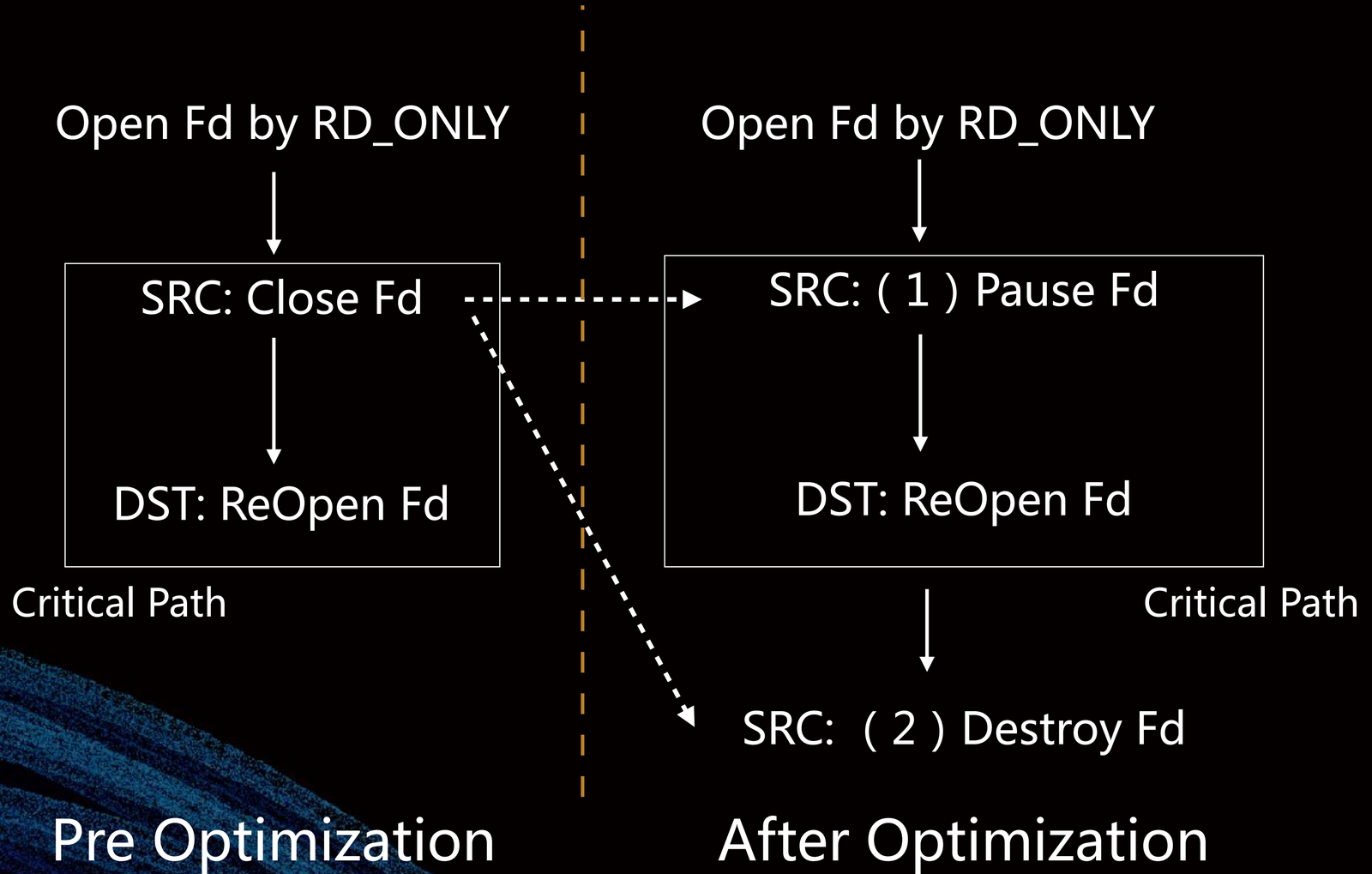
Cloud Disk Optimization

- Critical Path Optimization
- Light Weight Pause Operation



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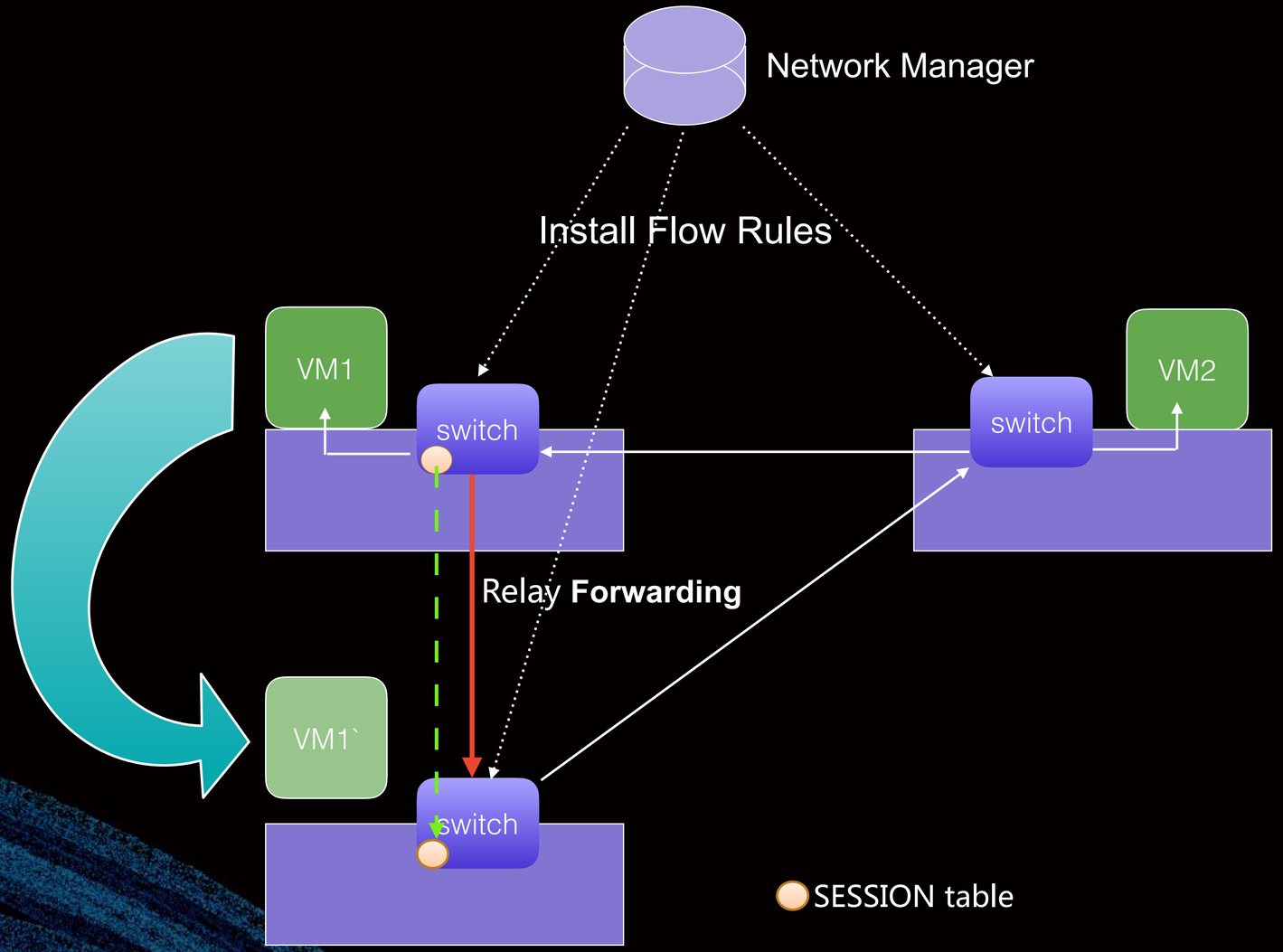
VPC/SDN Live Migration

- Copy SESSION table
- Relay Forwarding
- SESSION table update



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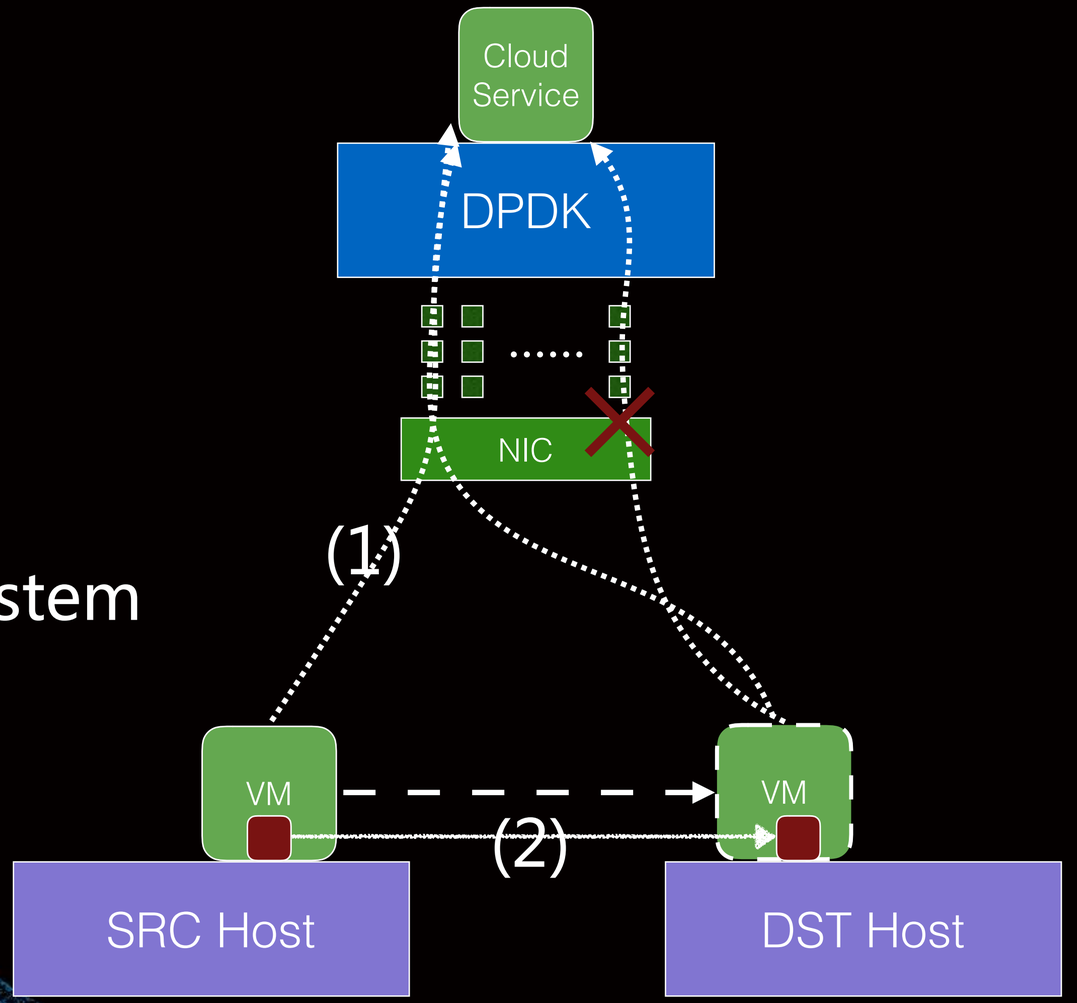
Add-on Cloud Services Stay Intact

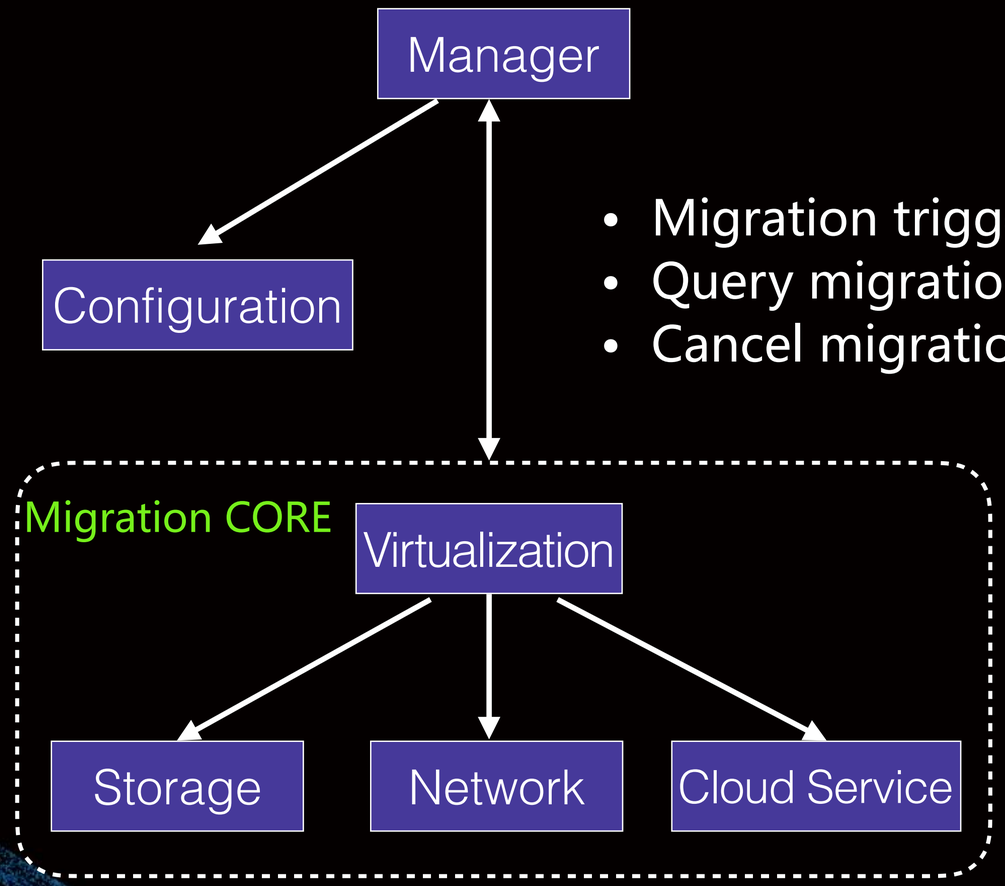
- Indirect VM-Host relationship
- Direct VM-Host relationship
- Live Migration friendly cloud ecosystem



Add-on Cloud Services

Control System

- Downwards time critical operation from control system to virtualization plane
- Migration procedure control
- Cluster/Host Configuration
- Control Policy



- Migration trigger point
- Query migration status
- Cancel migration

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Migration Test Data

VM Stress Type	VM Type	Total Migration Time	VM Downtime
idle	4u4g	~1min	70~80 ms
idle	16c32g	1~2min	70~90 ms
mem_stress	4u4g	1~2min	90~120ms
fio	4u4g	1~2min	90~120ms

Environment：Generation III instance
mem_stress: 512M dirty memory
fio： iodepth=32、bs=512、randread
Downtime may vary for different vm/hardware/software/stress type

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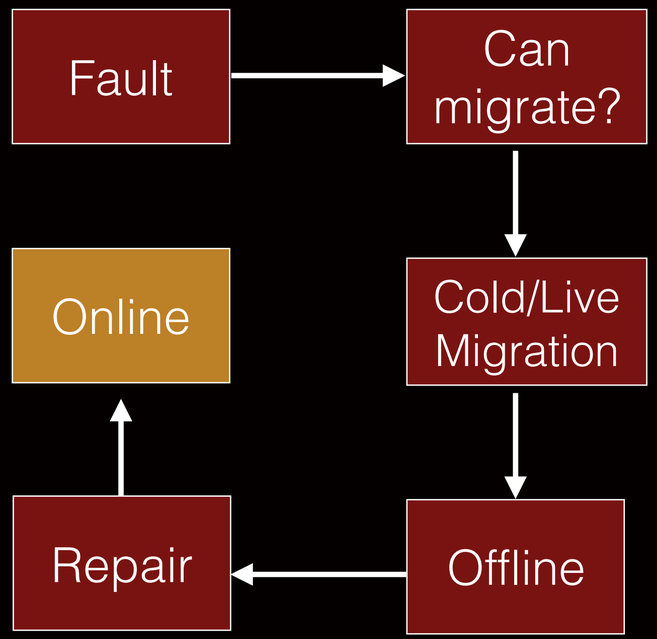
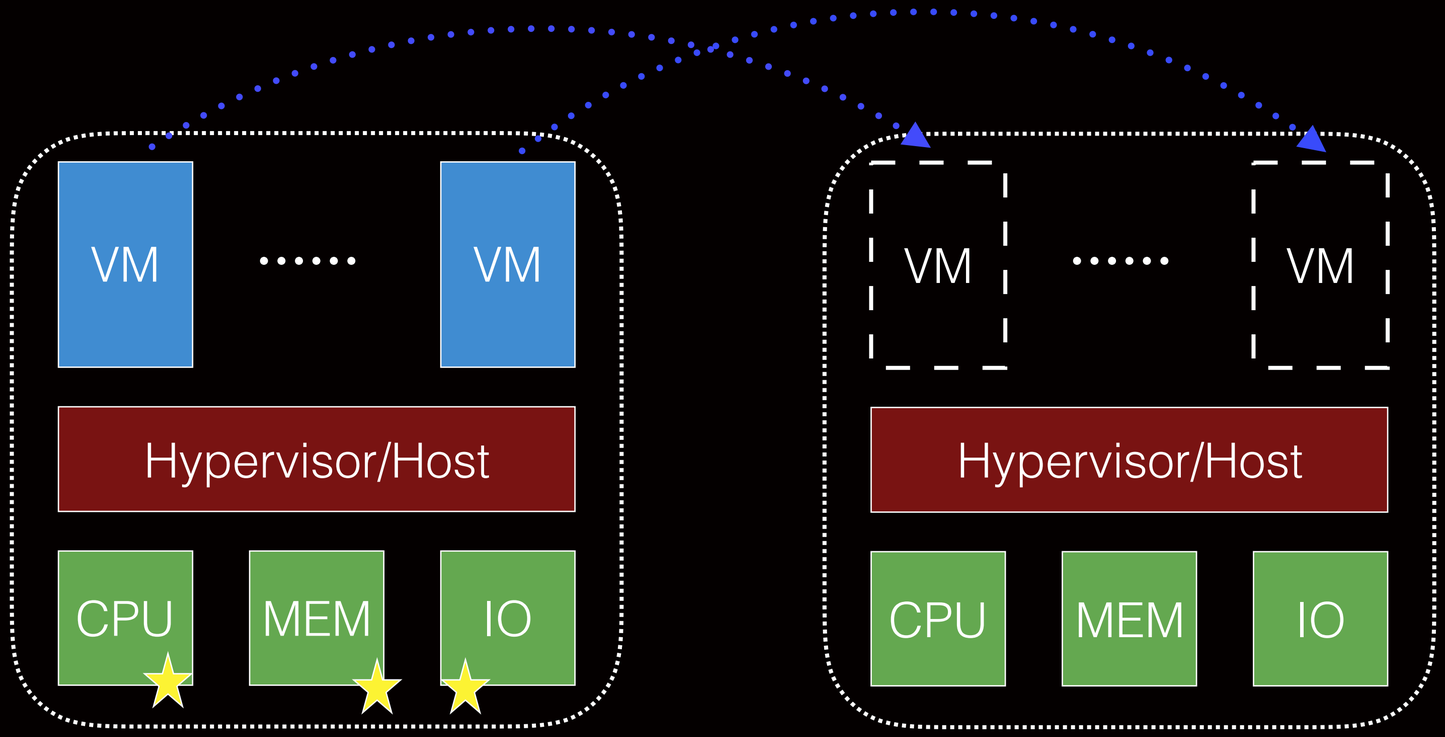
Application of Live Migration： Server Maintenance



HOST Maintenance Procedure

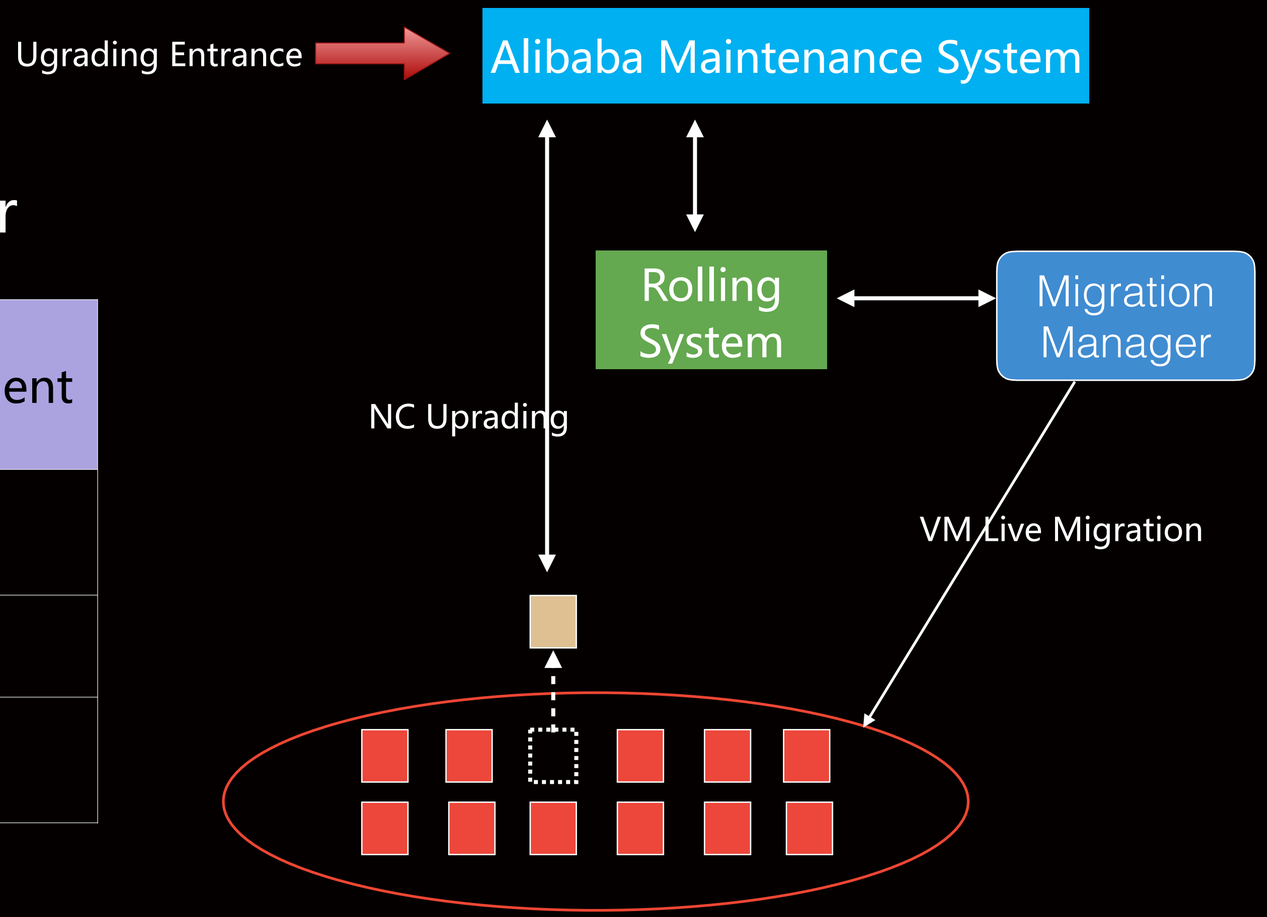


HOST Fault-Migration

Application of Live Migration： Kerne/Firmware Upgrading

Impoverments of the Whole Cluster

Kerne/Firmware Upgrading	Before	After	Improvement
Memory Bandwidth (MB/s)	30179	27873	8.27%
SPECjbb	128655	120552	6.72%
Packet Forwarding (MB/s)	610	570	7.02%



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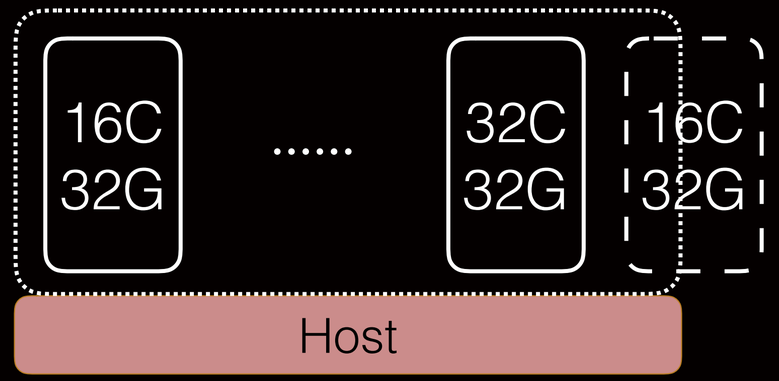
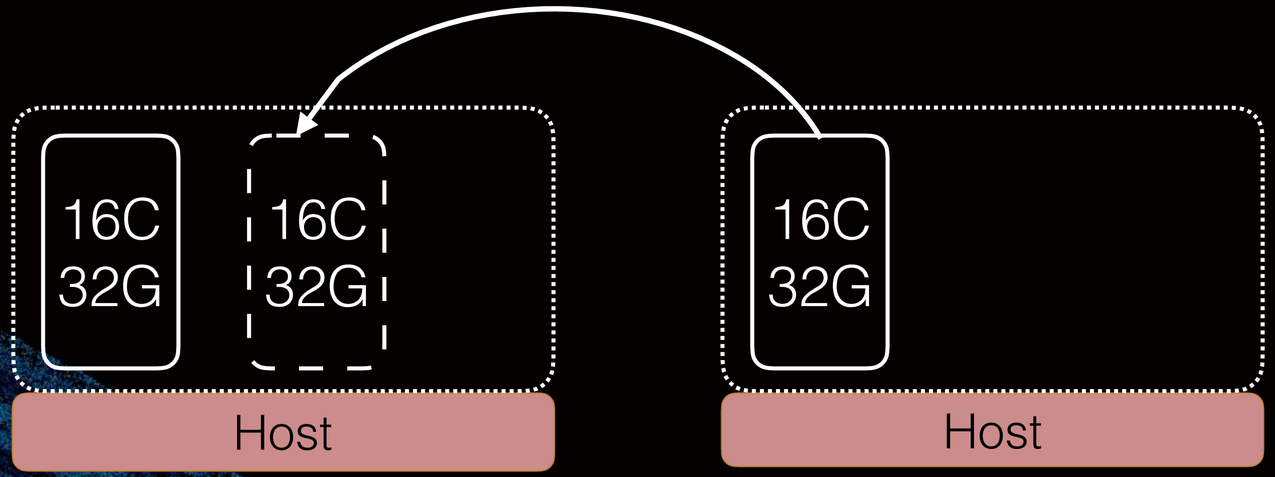
Application of Live Migration：Cloud Scheduling

- Doing
  - a) Resource defragments
  - b) Resource balance
- To Do
  - a) Power Management
  - b) other



(a) Resource Fragments



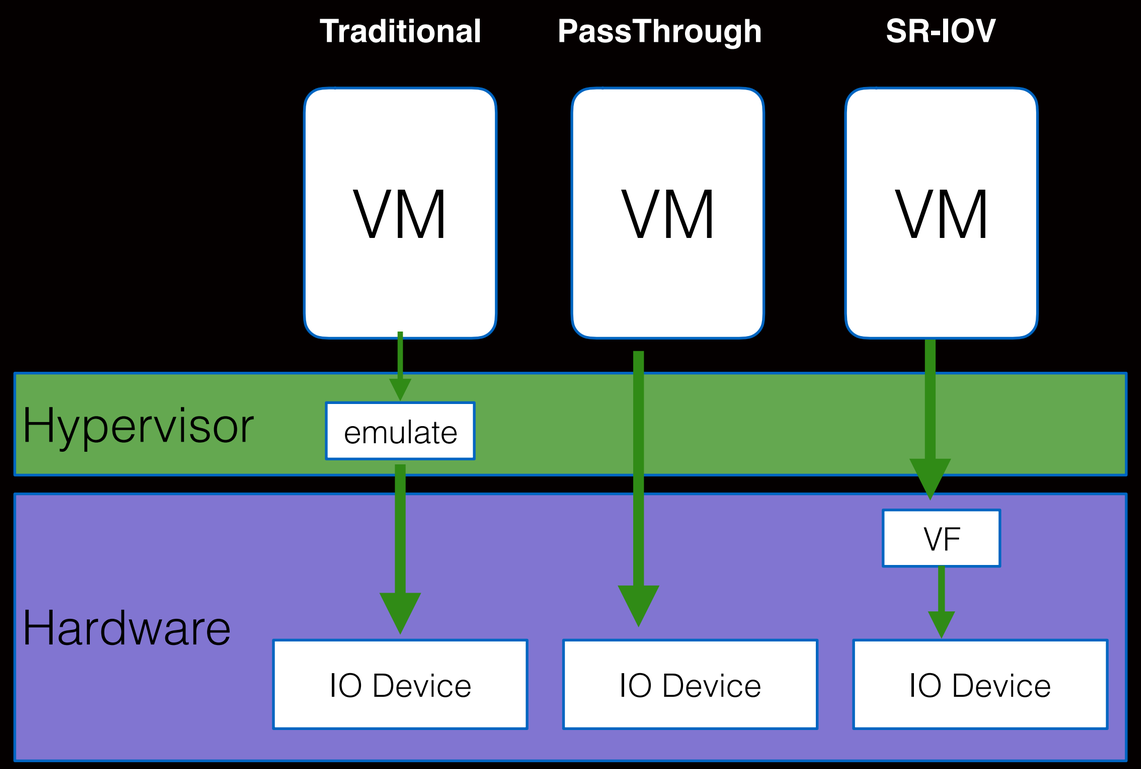
(b) Power & Resource Management

Future Challenges

SR-IOV/PassThrough Live Migration

Challenges：

- IO Register migration
- in-flight IO
- Guest aware



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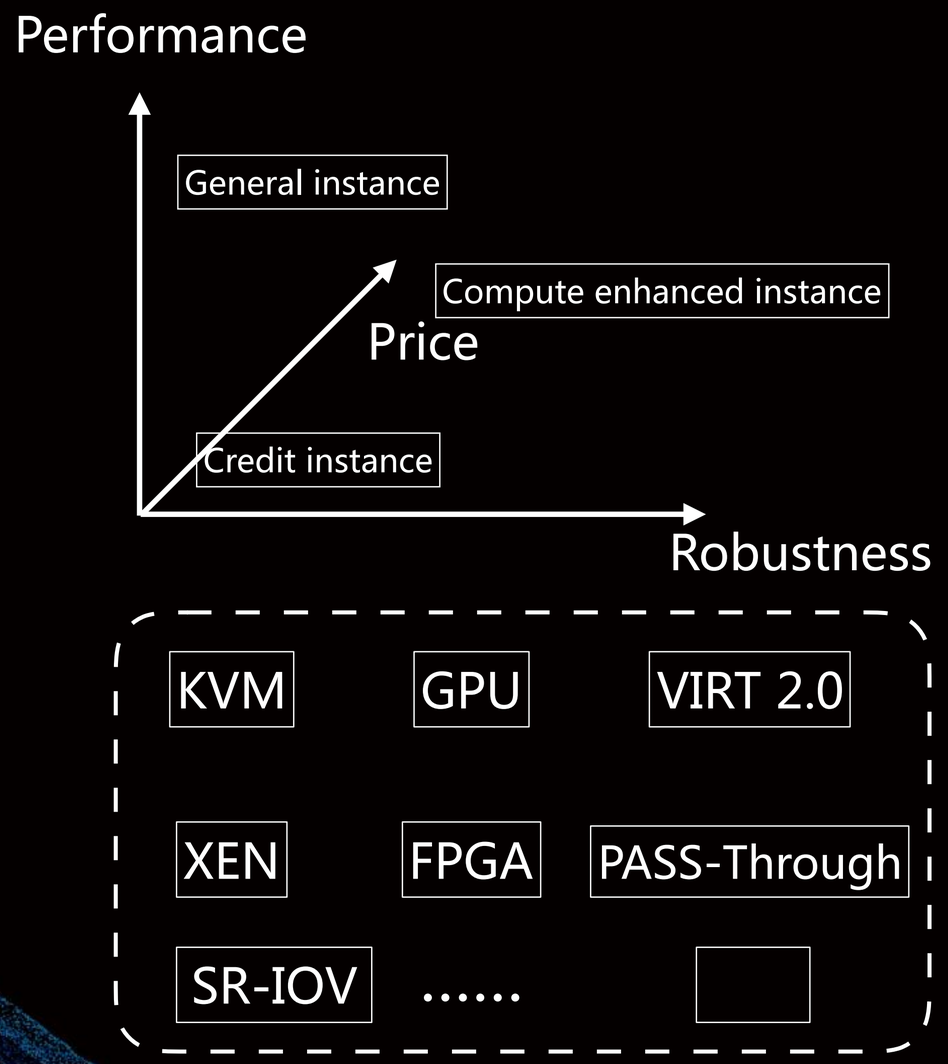
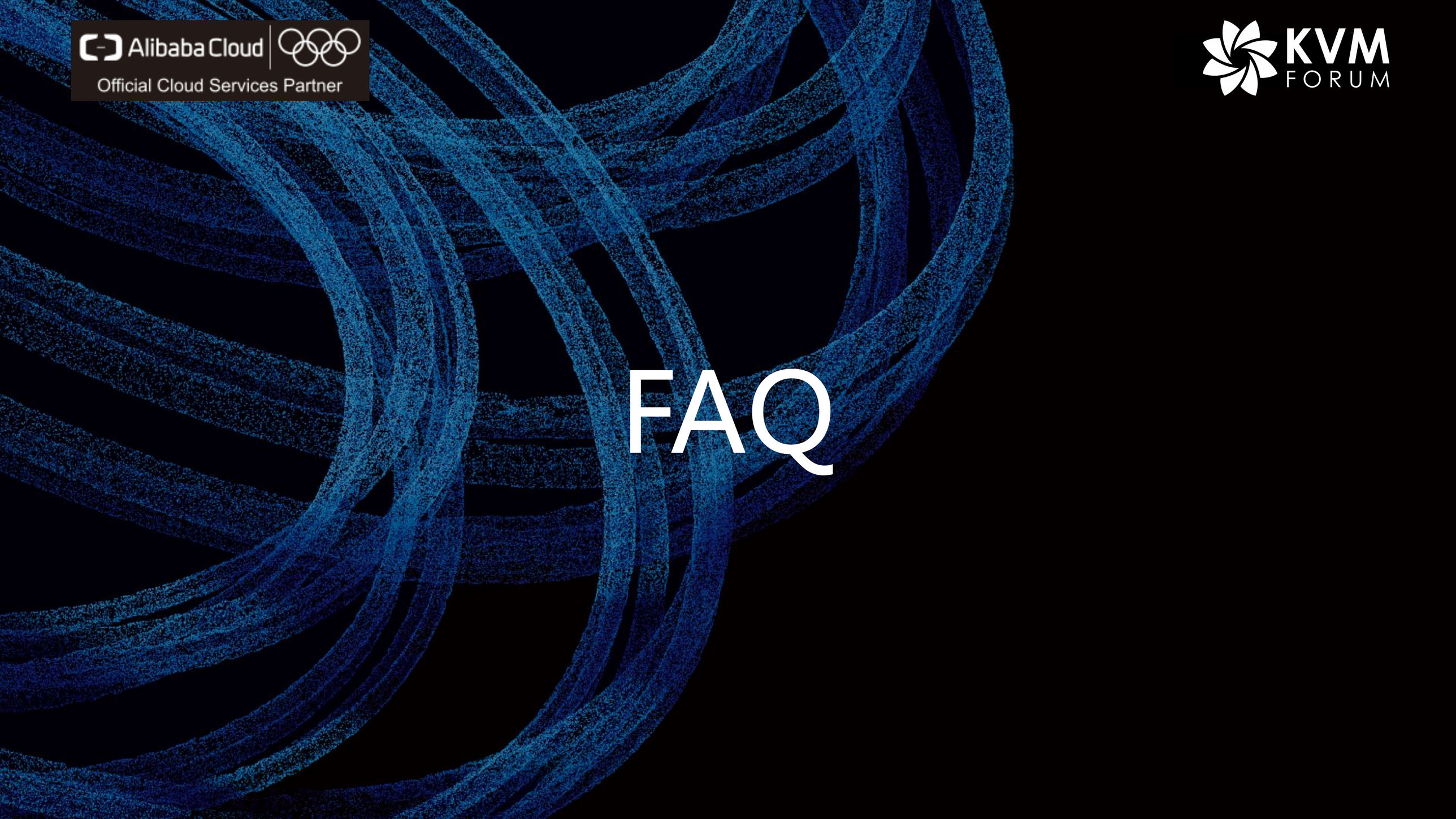
Ways to Start a Live Migration

- A variety of Instance types
- Navigate through heterogeneous architecture
- Enable more application practices

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