HPC Specific Topics

5th High Performance Container Workshop - ISC19

Scope and Introduction

This segment focuses on **HPC SPECIFIC** aspects.

It opens up a broader discussion on how HPC and non-HPC converge and what is missing...

Introducing:

Amazon FSx
for Lustre

Amazon FSx for Lustre

Massively scalable performance

Parallel file system

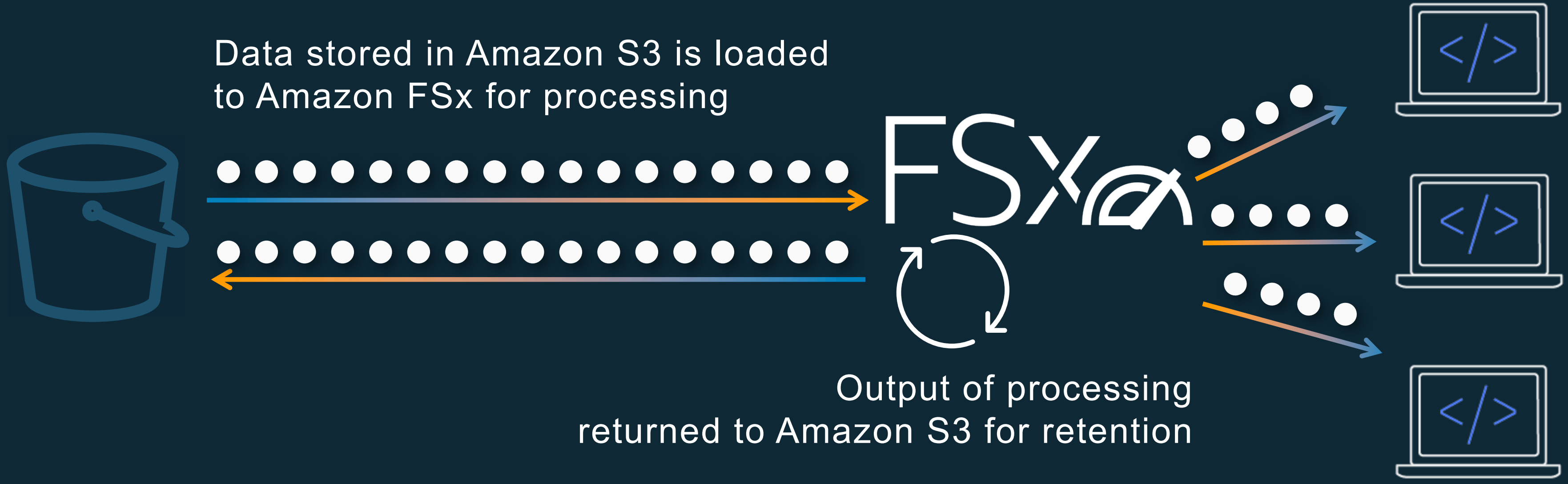
100+ GiB/s throughput
Millions of IOPS
Consistent sub-millisecond latencies

SSD-based

Supports hundreds of thousands of cores

Seamless integration with Amazon S3

Link your Amazon S3 data set to your Amazon FSx for Lustre file system, then….

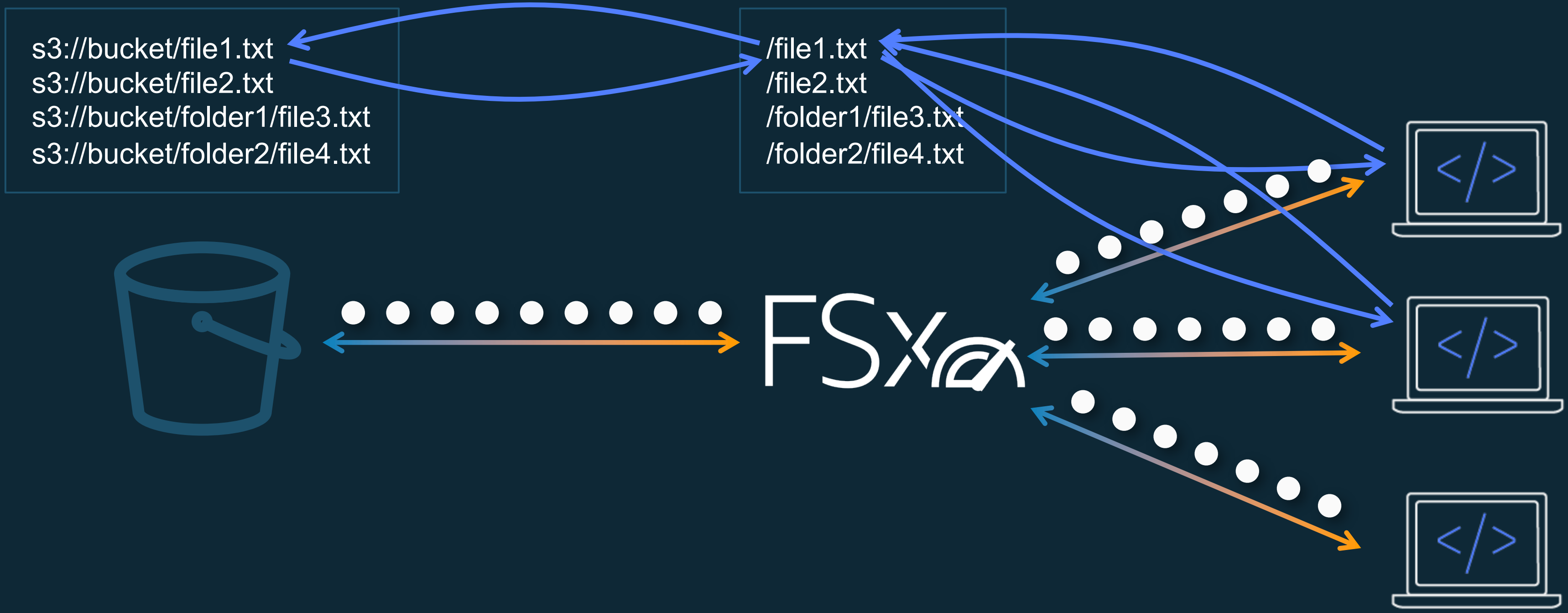


Data stored in Amazon S3 is loaded to Amazon FSx for processing

Output of processing returned to Amazon S3 for retention

When your workload finishes, simply delete your file system.

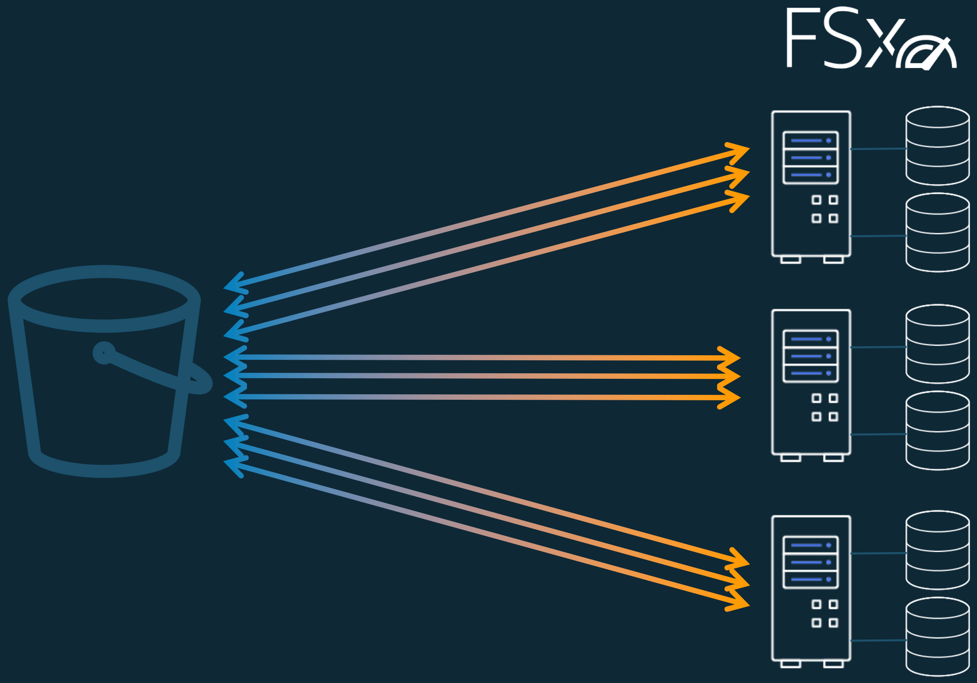
S3 lazy load example

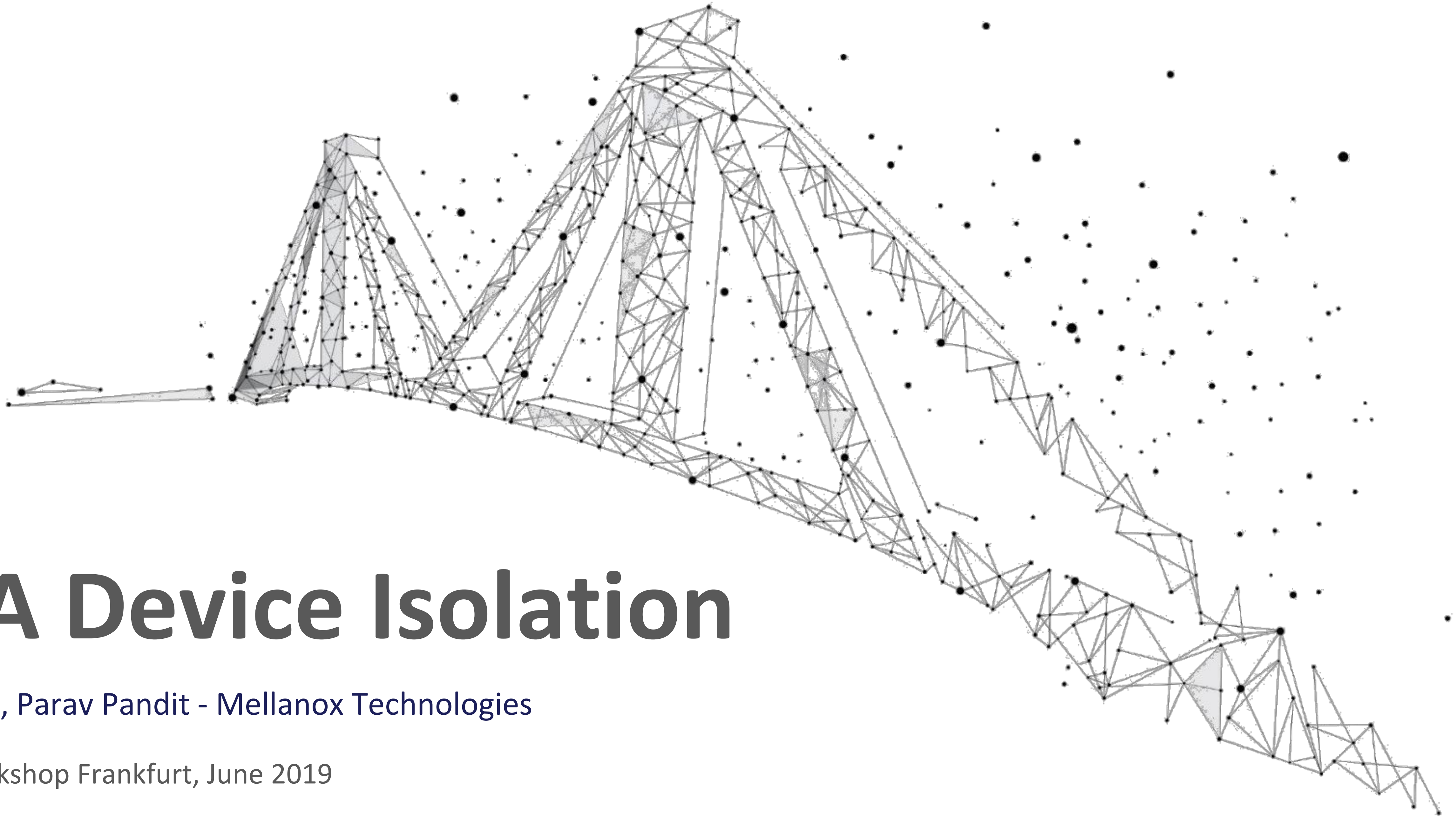


s3://bucket/file1.txt
s3://bucket/file2.txt
s3://bucket/folder1/file3.txt
s3://bucket/folder2/file4.txt

/file1.txt
/file2.txt
/folder1/file3.txt
/folder2/file4.txt

Amazon S3 integration is performance-optimized for fast data movement



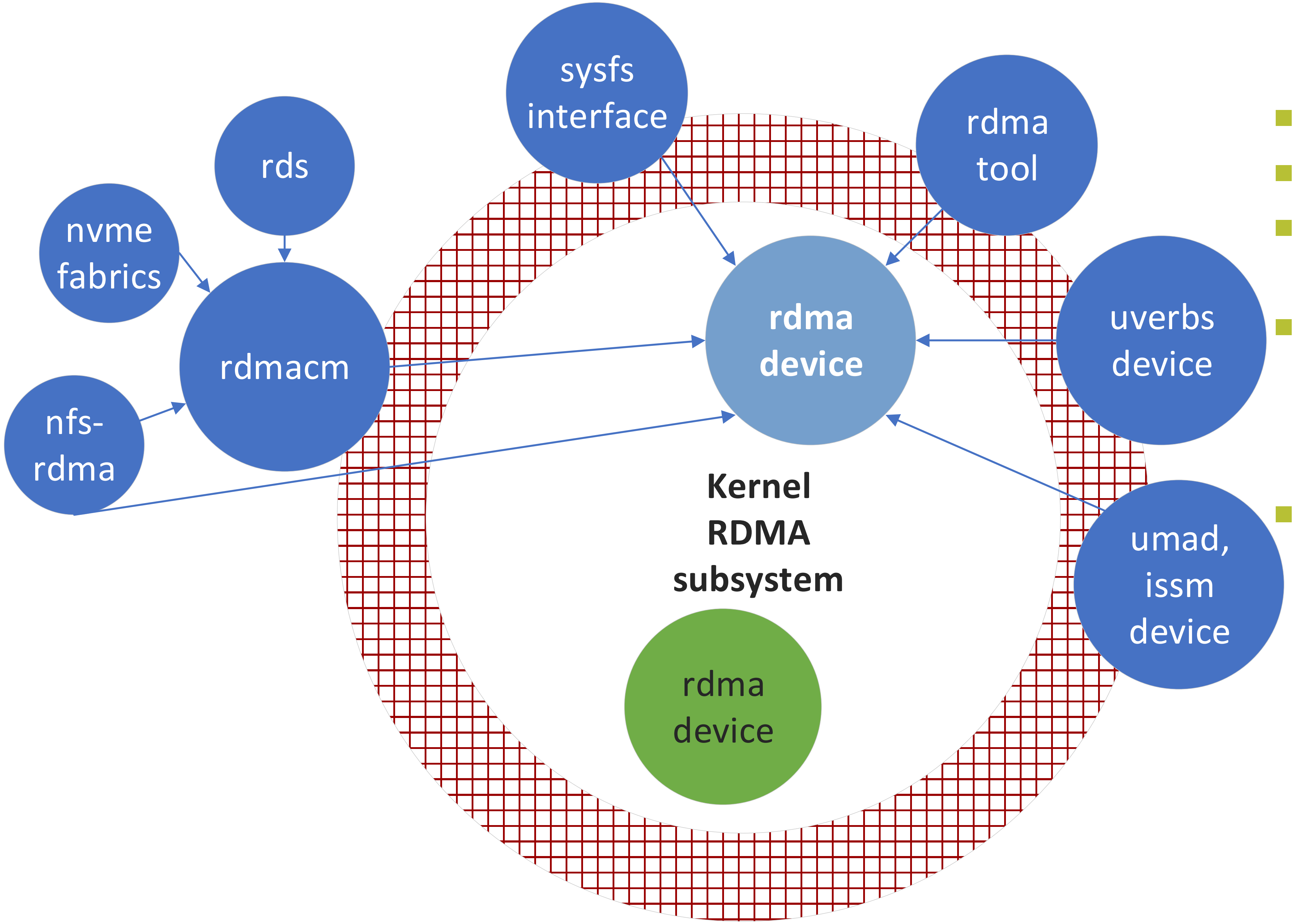


RDMA Device Isolation

Dror Goldenberg, Parav Pandit - Mellanox Technologies

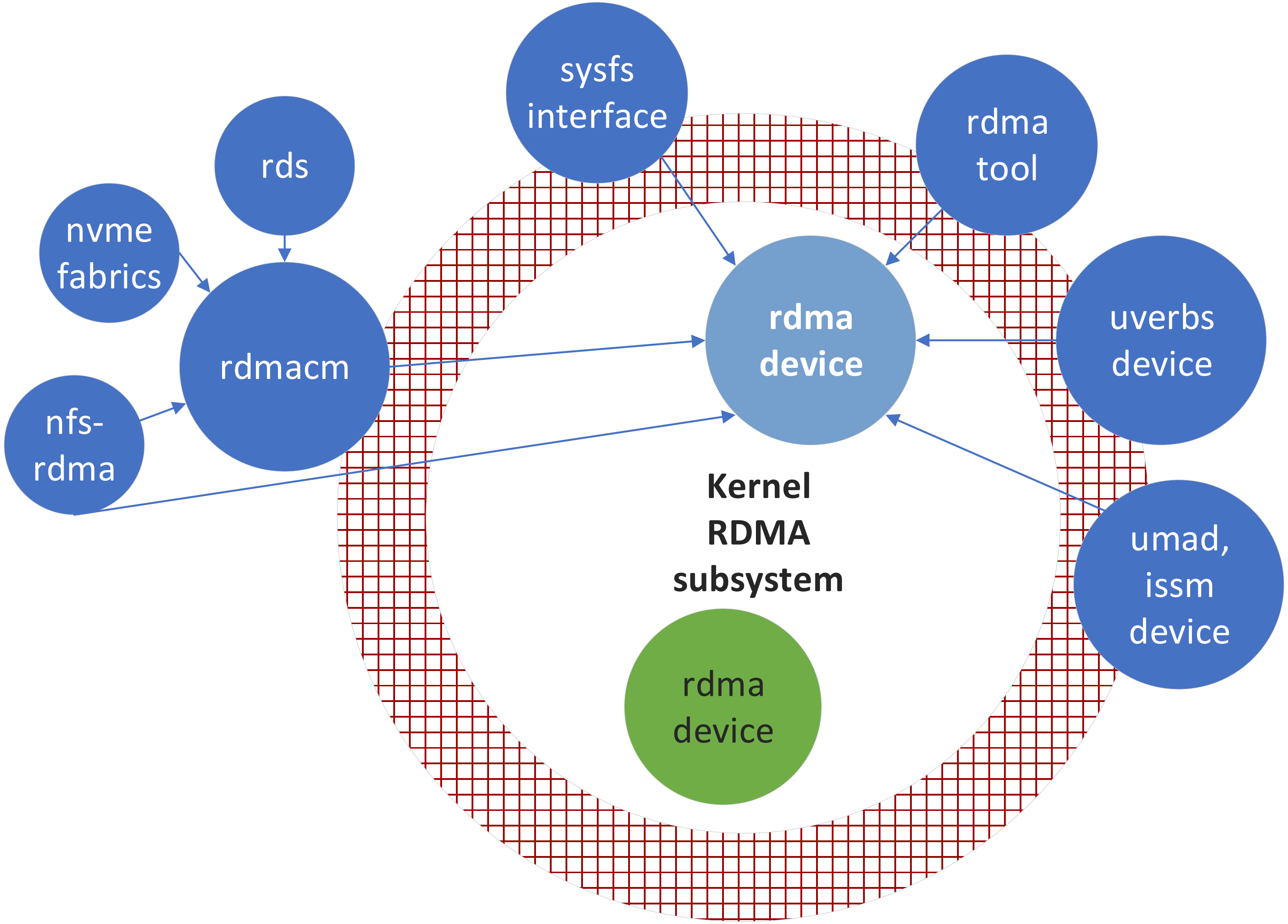
ISC Container Workshop Frankfurt, June 2019

RDMA Device Access Paths



- RDMA Connection Manager (CM)
- Verbs (via uverbs char device)
- Rdmatool (via netlink sockets)
  - Resource, connection information
- Sysfs file interface
  - Counters
  - Network addresses (IP/GID/LID)
  - More..
- UMAD char device
  - MAD packets
  - Device, address information

RDMA Device - The Need for Isolation

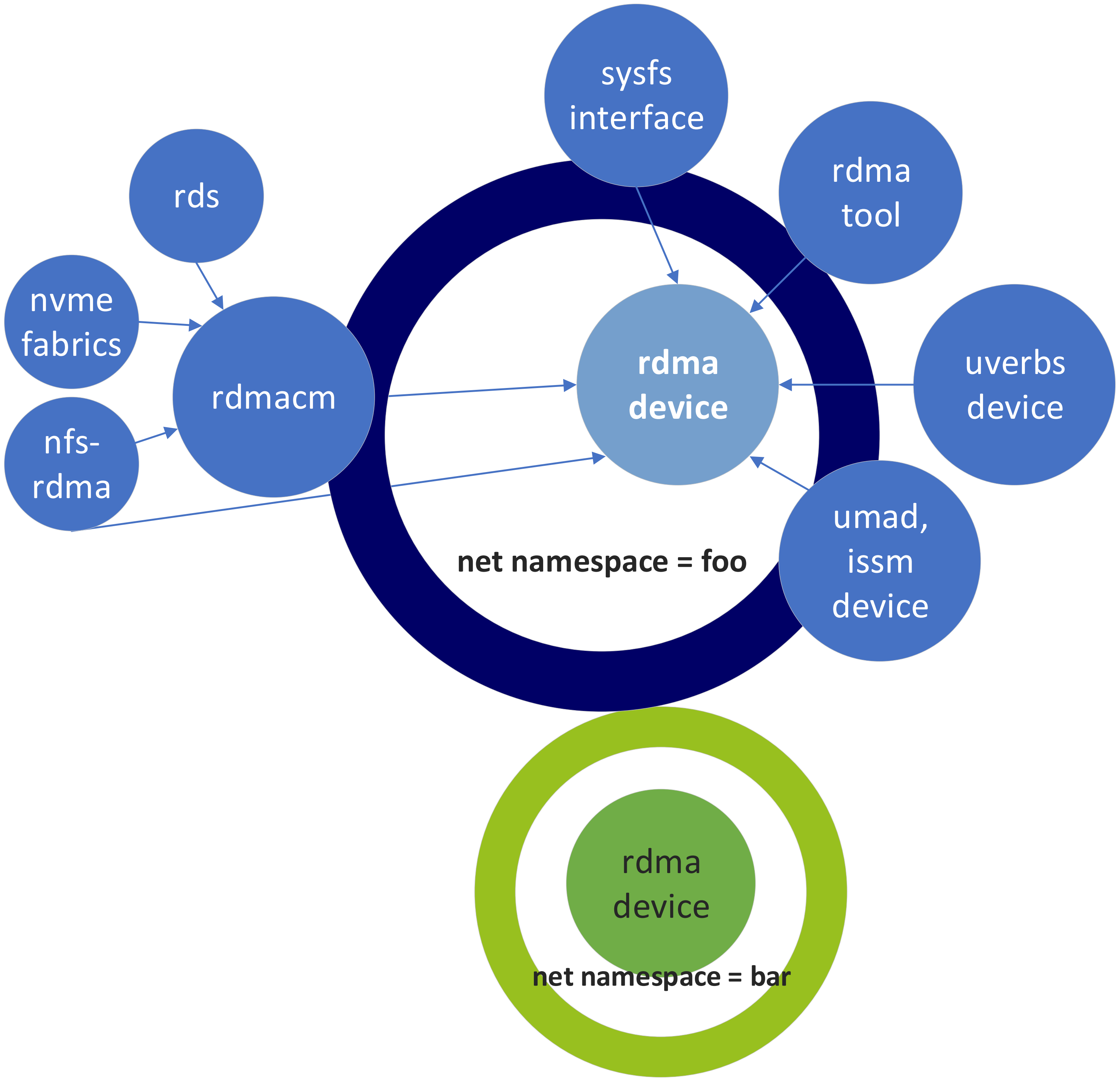


- Device cgroup - char devices ACL
  - Too coarse for network level
- RDMA cgroup - # of resources
  - Does not control the network access
- RDMA is yet another network device

Need to protect RDMA devices

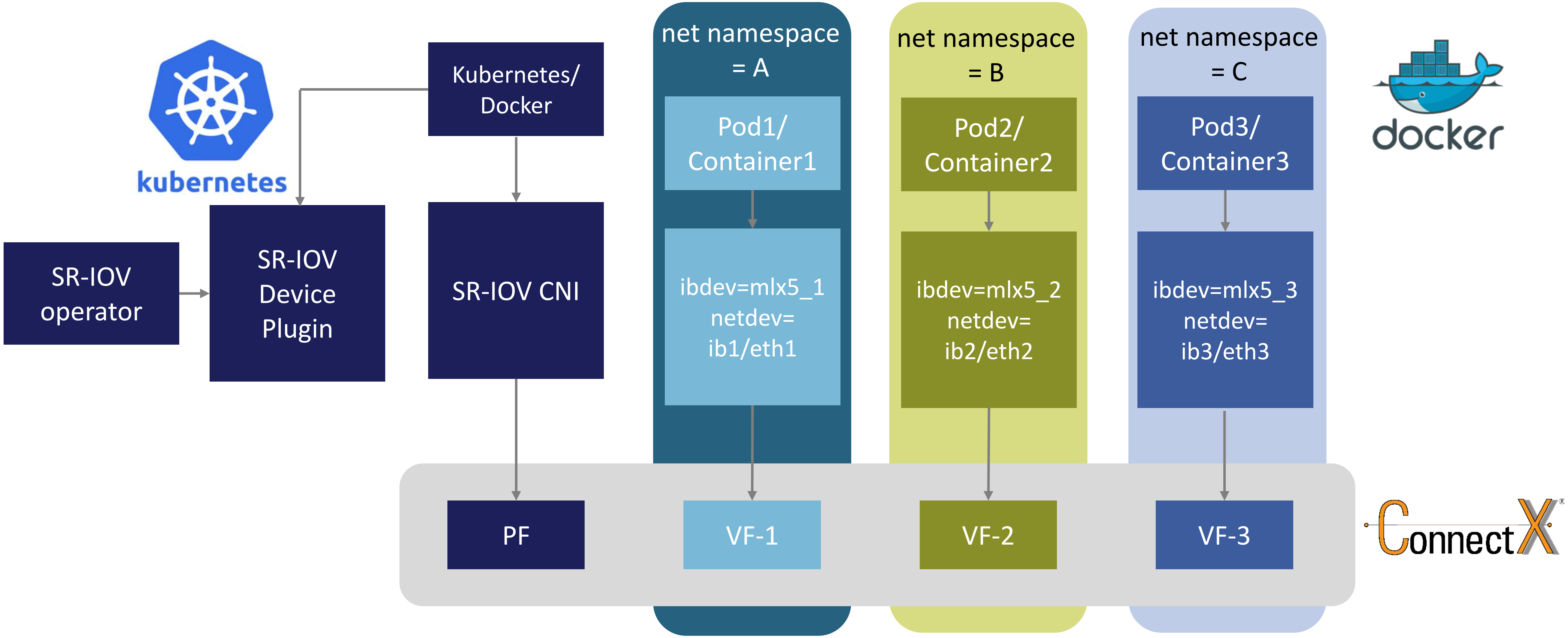
- At the network level
- In a reliable, unified, deterministic way
- Fit in existing orchestration frameworks (CNI, device plugin…)
- Future proof for new apps, interfaces, APIs
- Backward compatible

RDMA Devices in Net Namespace



- Isolation ring to access the RDMA device
  - Use existing net namespace of Linux kernel
- RDMA network namespace modes
  - Exclusive or shared
  - Via netlink
- Default as shared mode (backward compatible)
- RDMA device associated with net namespace
  - New netlink command
- Integrates with CNI and device plugin of K8s, Docker network plugin extension

RDMA Devices in Network Namespaces



Mellanox ConnectX Adapter Card with SR-IOV Enabled

- Every container/POD has an IB device (mlx5_1,2,3) and netdevice
- Isolation is done on the net namespace level

Additional Information…

- Examples
  - Query, Change RDMA subsystem mode
    - $ rdma system show
    - $ rdma system set netns exclusive
  - Move RDMA device to new network namespace
    - $ ip netns add foo
    - $ rdma dev set mlx5_1 netns foo
- Current status (6/15/2019)
  - Merged to upcoming Linux kernel 5.2 and iproute2/rdma tool
  - Merged to netlink golang library
- Ahead of us
  - Integrate to docker sr-iov plugin
  - Integrate to SR-IOV operator and CNI plugin

Thank You