NML-MRS Modeling
Use Case 1: Cloud VM Host

Topology

VirtualSwitchService — attributes → I/O metrics

OVS

hasService

SwitchingService

providesPort

SwitchingService

providesLink

providesLink

Node

hasService

eth0

PortGroup VM-FEX

Port

Port **Node** **Port**

Port 1

Port 2

VM

hasService

providesVNic

providesVM

KVM

capacity metrics ← attributes — HypervisorService

HypervisorBypass
InterfaceService
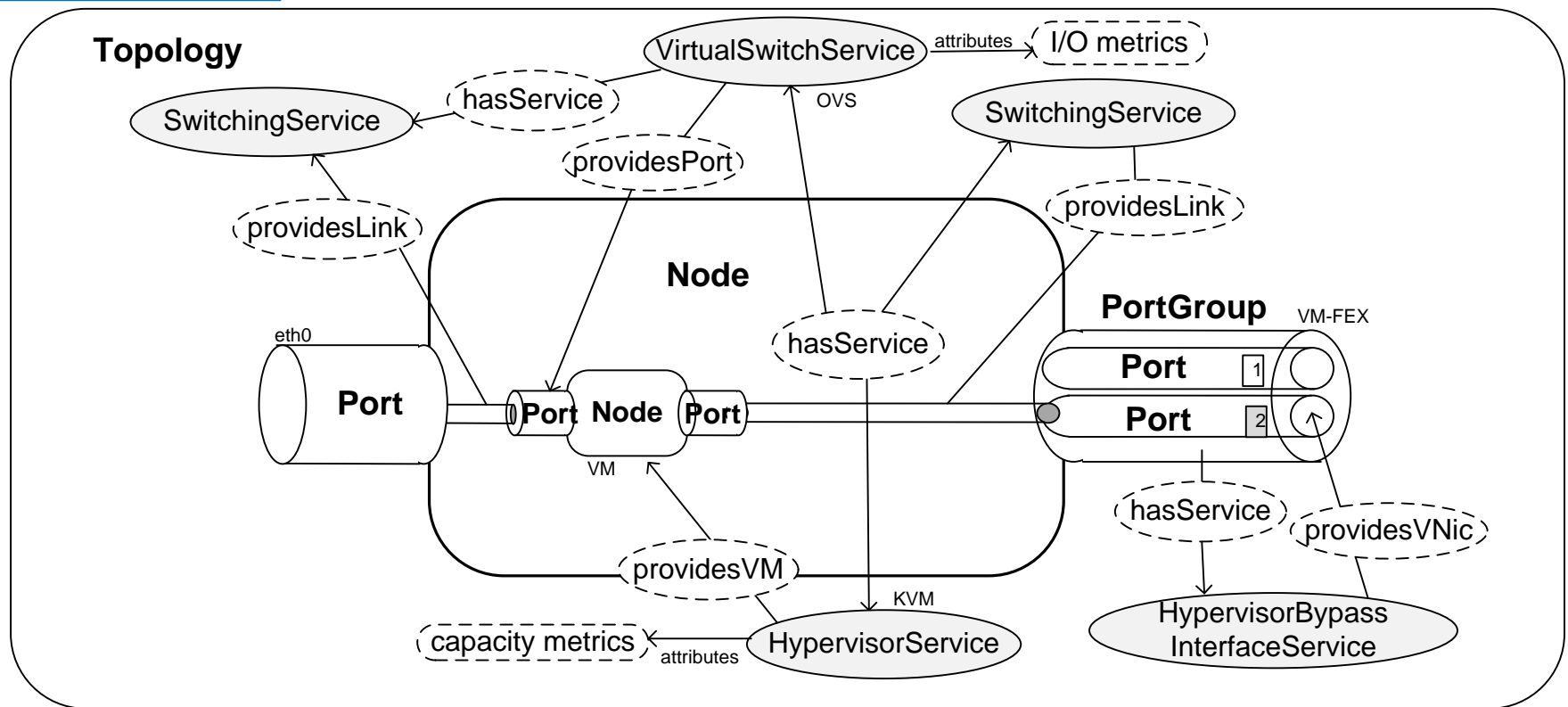
Alternative Modeling for OVS

Node

Port

Port **Node** **Port**

Port **Node**

OVS

VM

providesLink

providesLink

hasService

SwitchingService
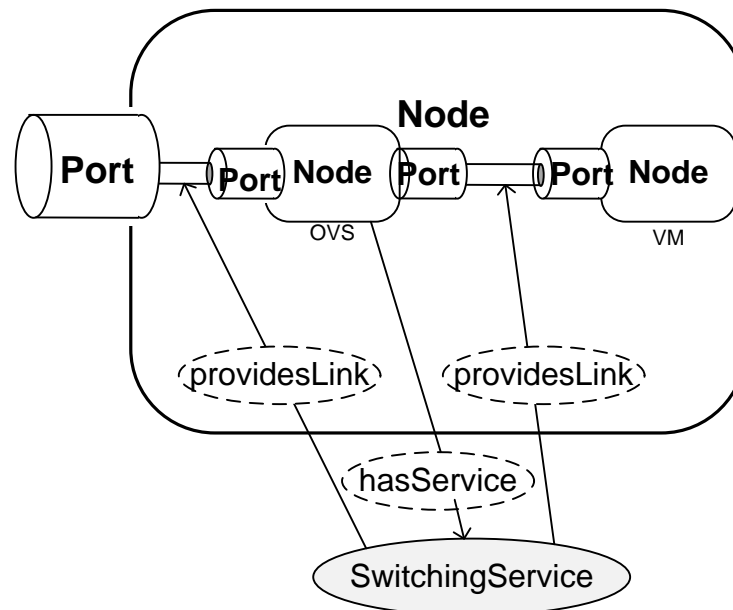
NML-MRS Modeling
Use Case 2: HPC Cluster

Topology

SwitchingService

providesLink   providesLink

Topology or **Node**

hasService

Node | Port | Port

compute node

Node | Port | Port

compute node

Port | Port | **Node** | Port

network gateway

providesPort   providesPort

I/O metrics ← attributes — ClusterNetworkService

extend if needed

InfinibandSpecificService   EthernetSpecificService
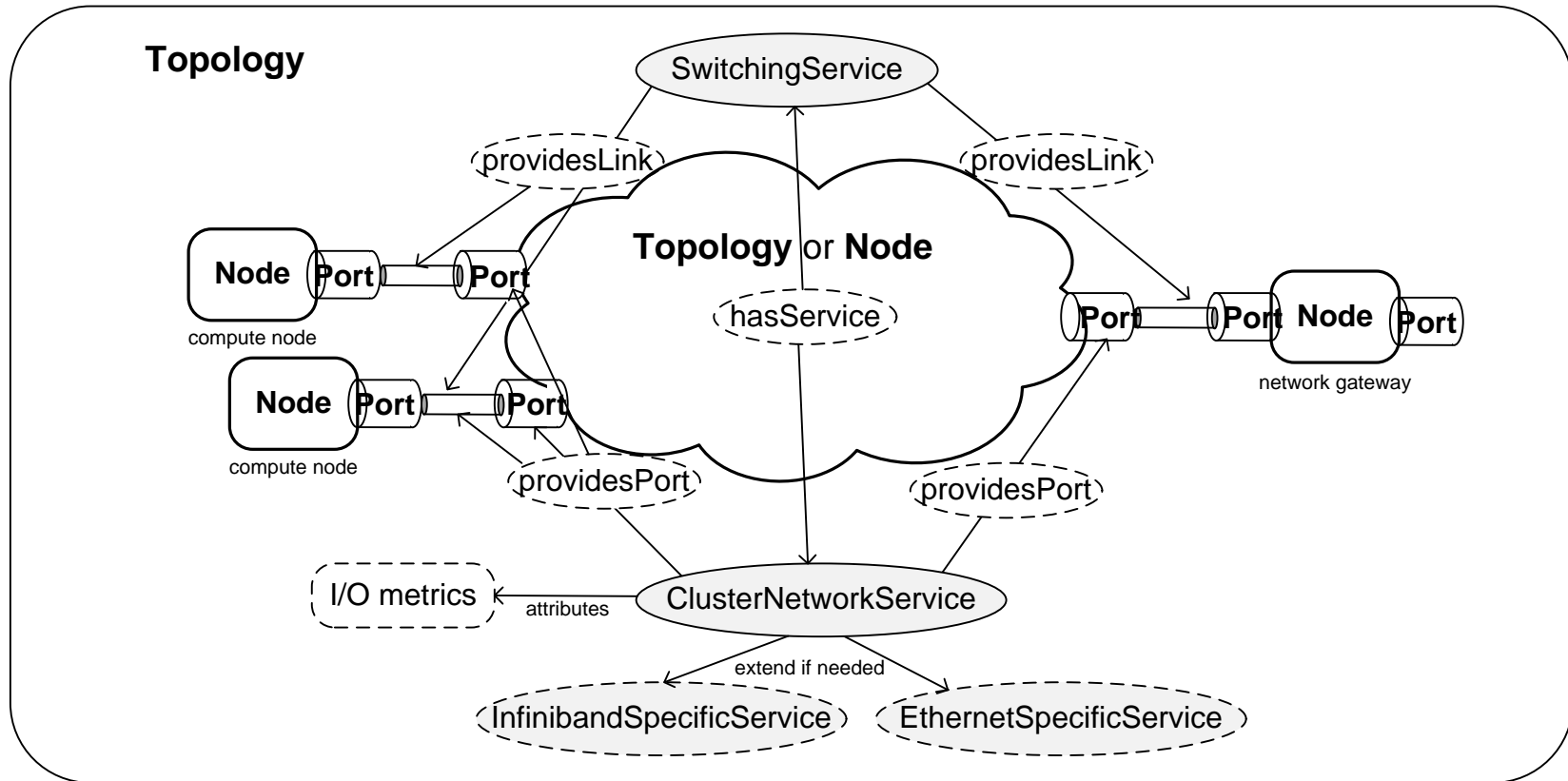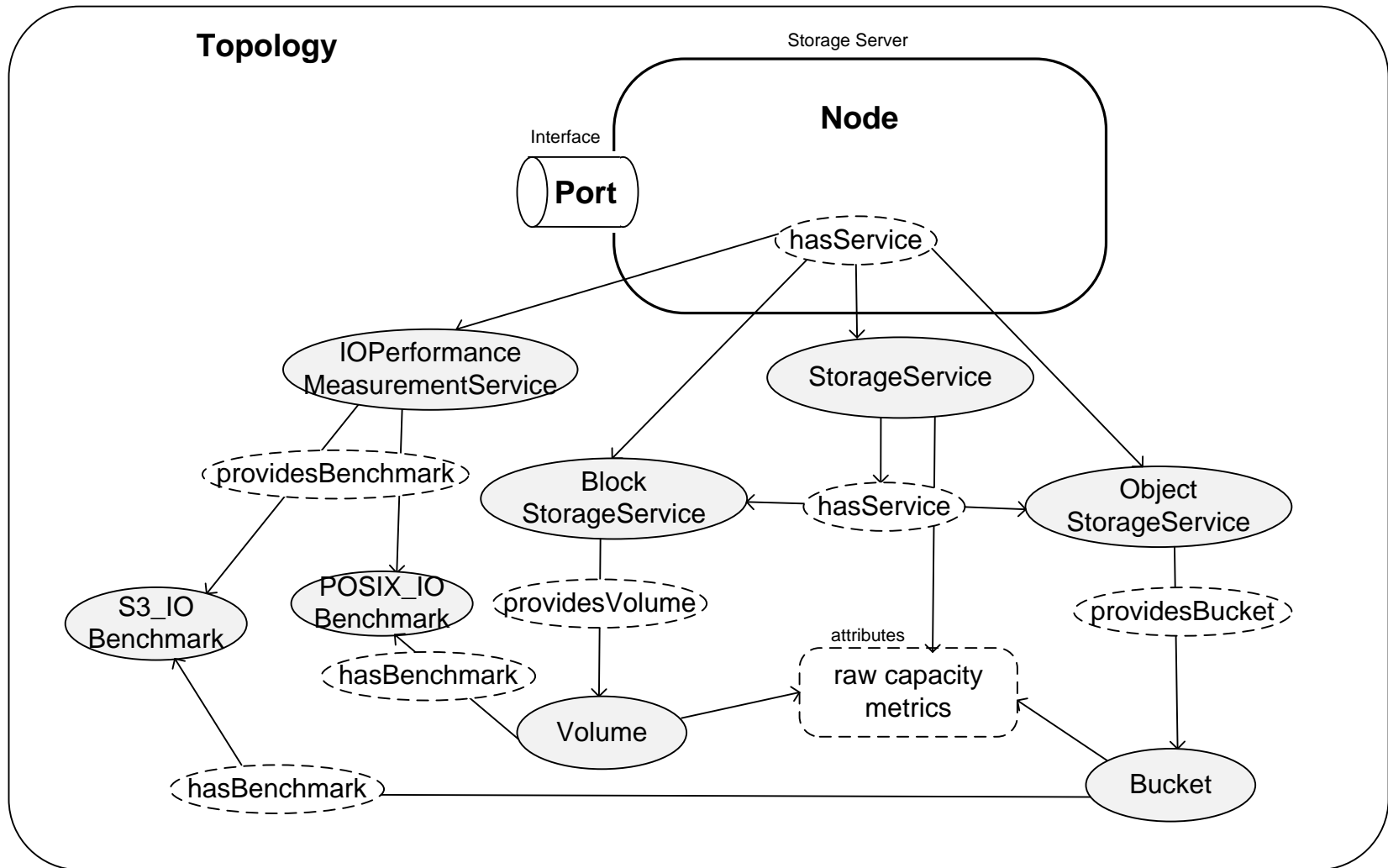
NML-MRS Modeling
Use Case 3: Networked Storage

NML-MRS Modeling
Use Case 4: Multi-Layer Network

Topology

containing-relation hierarchy

layers capable of (de)adaptation

PortGroup

Node

PortGroup

isAlias

Port
Port
Port
Port

OCh
OCh
OCh
OCh

OCG

Label
OCh# (layer-1)

providesPort

LabelGroup
VLANs (layer-2)

canProvidePort

PortGroup

OCG

hasService

Port fiber_in

hasService

Deadaptation
Service

canProvidePort

LabelGroup
IP/MPLS (layer-3)

Fiber

Port fiber_out

hasService

Adaptation
Sevice

canProvidePort

LabelGroup
VLANs (layer-2)

Label: Fiber (layer-0)

canProvidePort

LabelGroup
IP/MPLS (layer-3)

Multi-layer by
transport hierarchy

hasInboundPort

hasOutboundPort

providesPort

Label
OCh# (layer-1)

Multi-layer by
adaptation

SwitchingService

isAlias

cross-connect

peer with remote node / port