Azure Networking WAN Scenarios
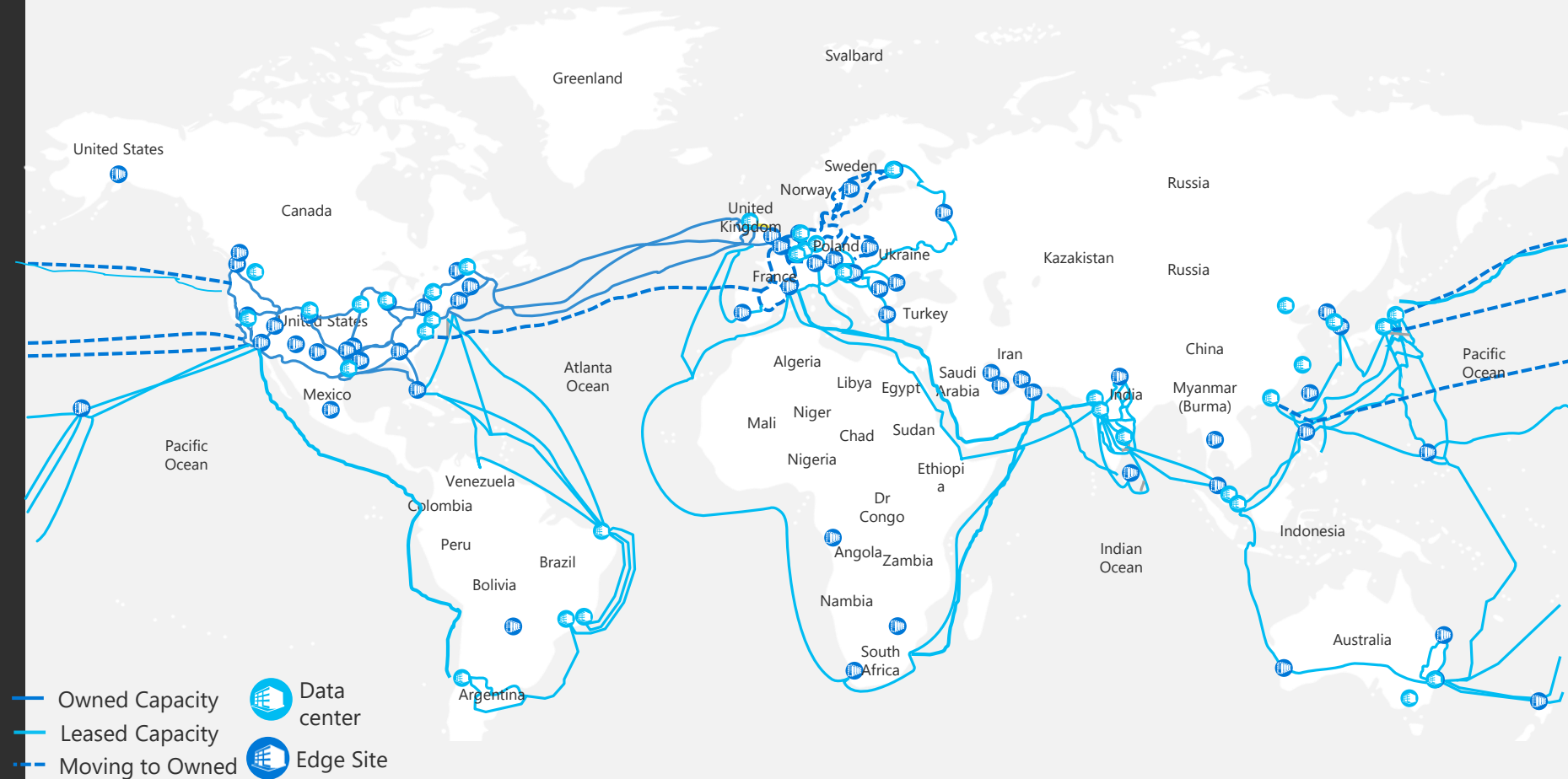
Yves Pitsch
Gary Ratterree

Microsoft

Azure
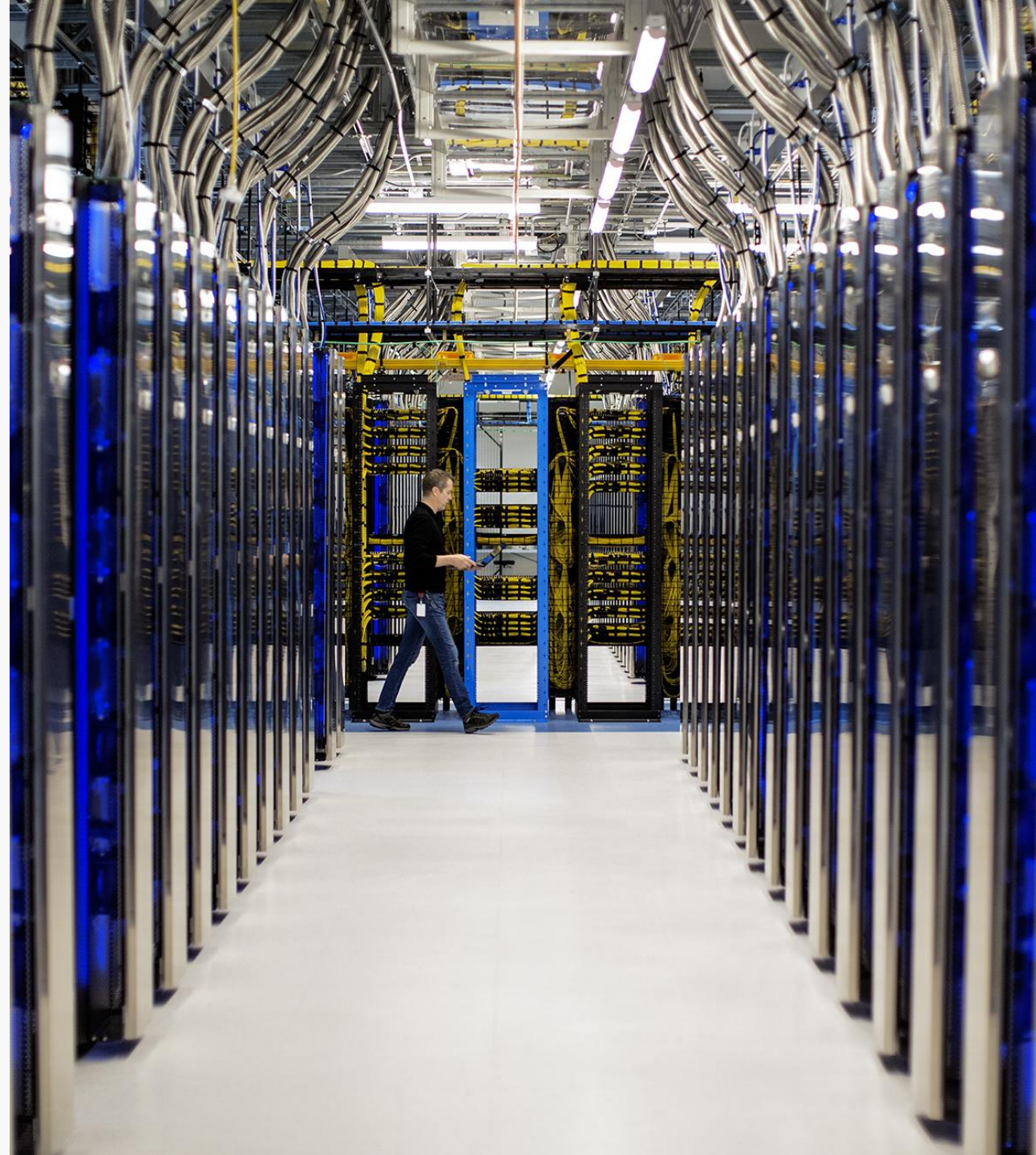
Microsoft Global Network

One of the largest private networks in the world

- 8,000+ ISP sessions

- 130+ edge sites

- 44 ExpressRoute locations

- 33,000 miles of lit fiber

- SDN Managed (SWAN, OLS)

DCs and Network sites not exhaustive

Owned Capacity
Leased Capacity
Moving to Owned
Data center
Edge Site

Regional Networks

High Availability Design

Regional network gateway

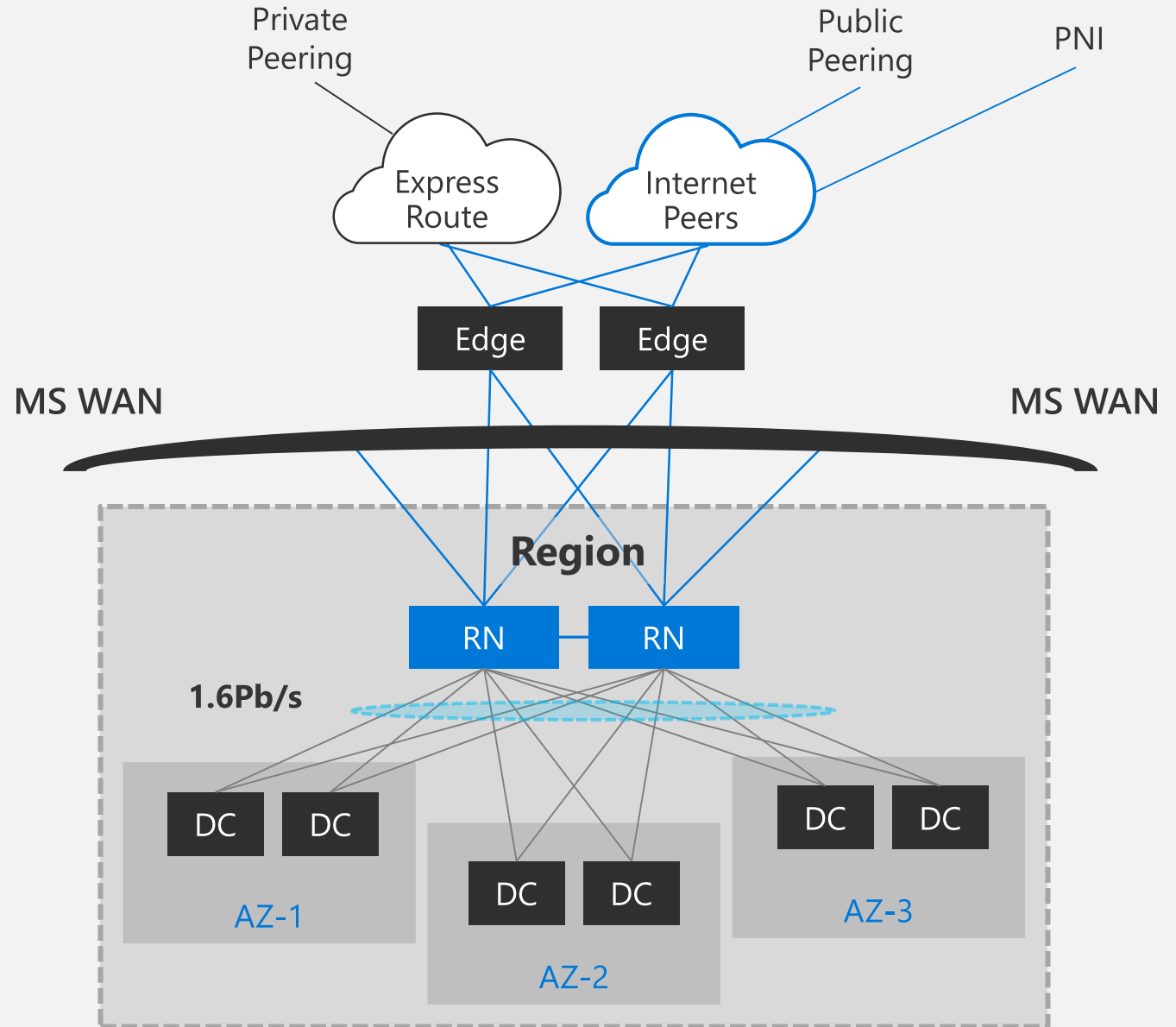Massively parallel, hyper scale DC interconnect (up to 1.6 Pb/s)

Space and power protected

RNG data centers

T-shirt sized (S,M, L, XL)

Contains server racks, DC NW

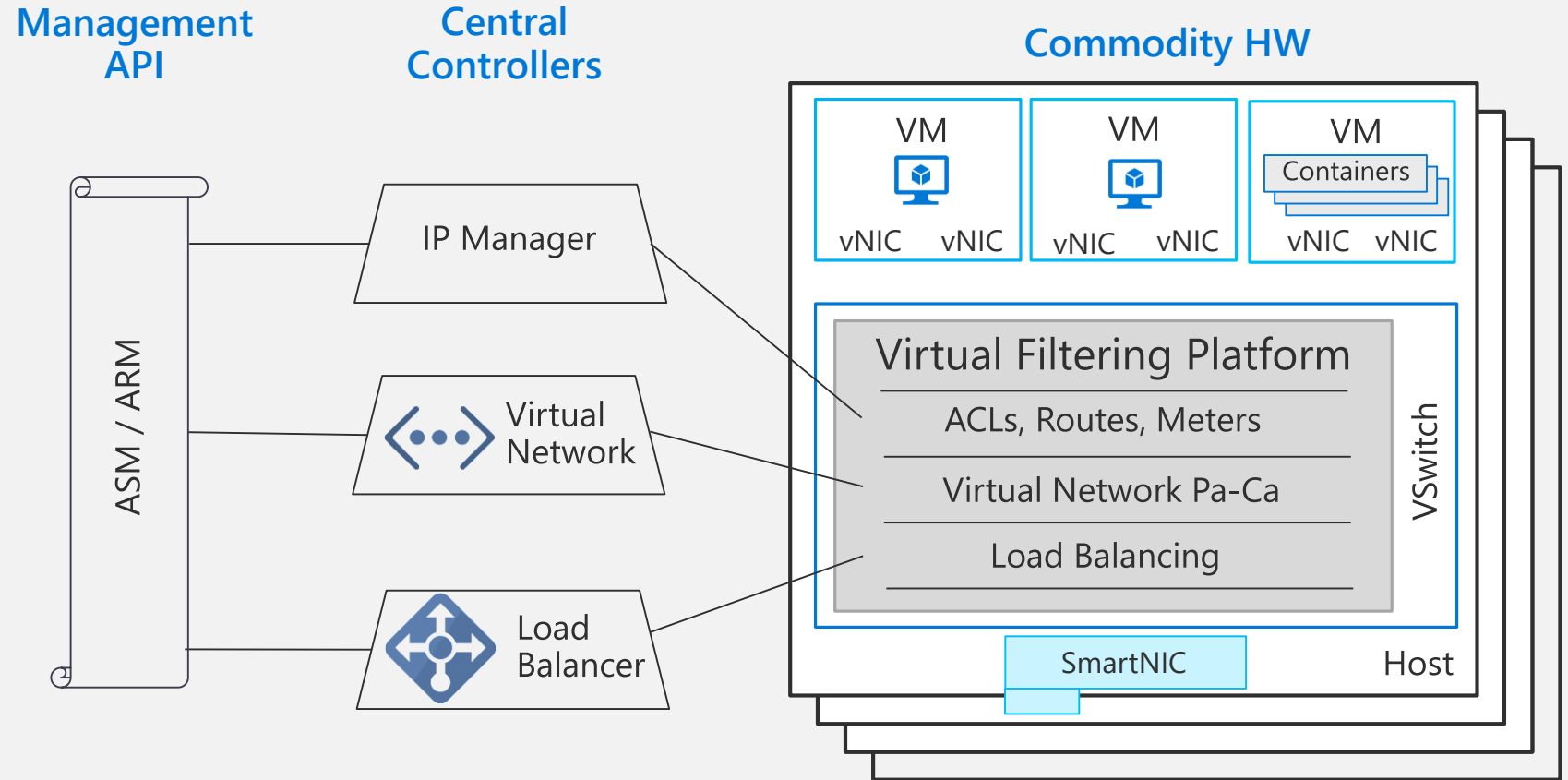RNGs are sized to support growing the region by adding data centers

Private Peering

Public Peering

PNI

Express Route

Internet Peers

Edge   Edge

MS WAN   MS WAN

Region

RN — RN

1.6Pb/s

DC DC

DC DC

DC DC

AZ-1   AZ-2   AZ-3

Software Defined Networking (SDN)

Azure SDN
Basis of all NW virtualization in our datacenters

Decoupled
SDN allows compute to evolve and converge to a single allocator

Management API

Central Controllers

Commodity HW

ASM / ARM

IP Manager

Virtual Network

Load Balancer

VM

vNIC   vNIC

VM

vNIC   vNIC

VM
Containers

vNIC   vNIC

Virtual Filtering Platform

ACLs, Routes, Meters

Virtual Network Pa-Ca

Load Balancing

VSwitch

SmartNIC

Host

Key to flexibility and scale is Host SDN

SDN for WAN (SWAN)

Global control plane for Inter-DC network

**High Network Utilization**

Router agents for FIB programming
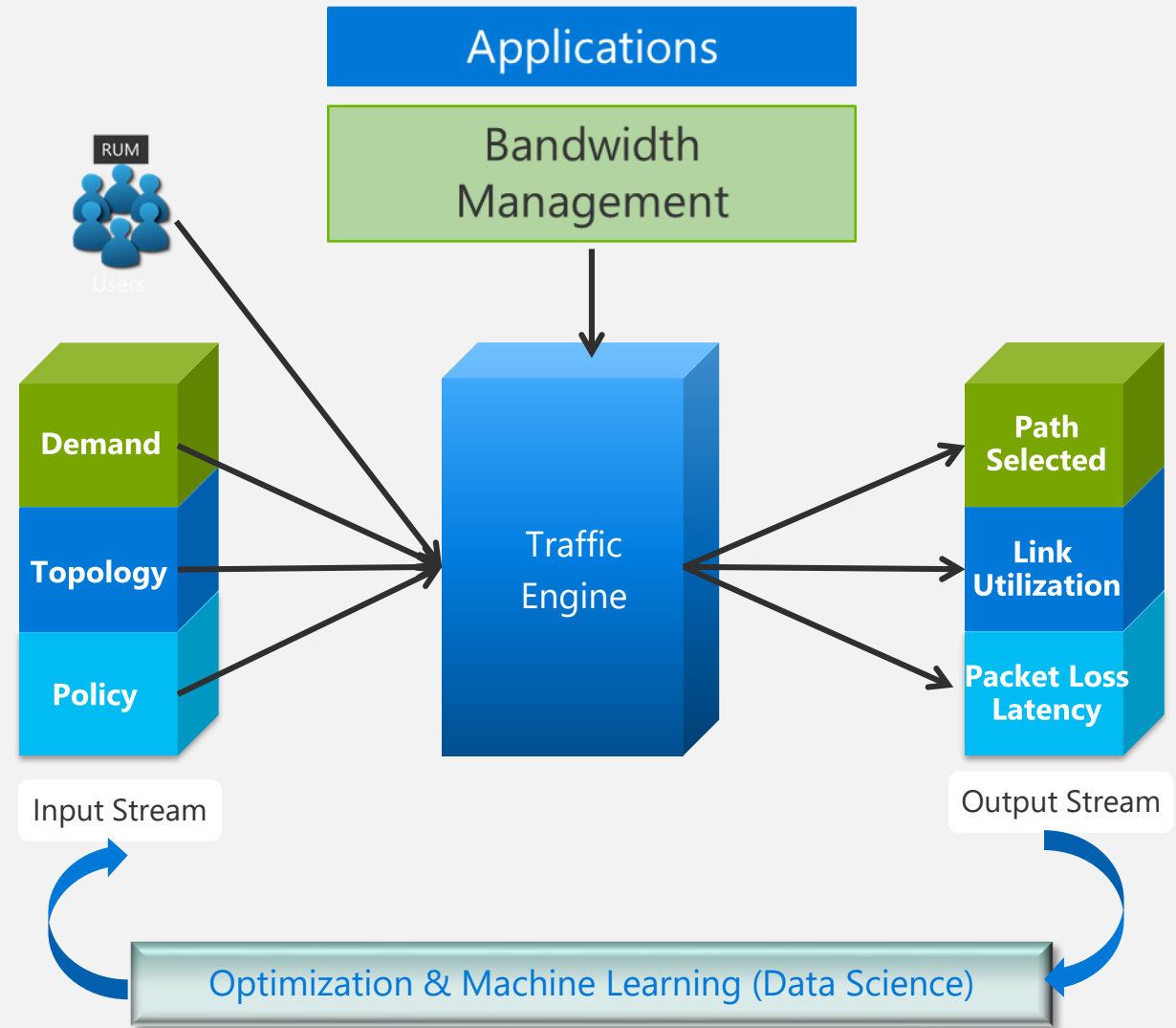
WAN Challenges and Microsoft innovation

100G Colored QSFP28C

- Power and Space: Massive scale achieved by embedding the worlds lowest cost, lowest power per bit technology into commodity switching

- Exponential growth: **SWAN**
  - Reduce dependencies
  - Reduce hardware lifecycle effort
  - Increase Network Utilization

- Supply chain diversity, Optical agility: **OLS**

- What next? **SONIC for WAN**…

SDN Controller

TRX
TRX

TRX
TRX

L2/L3 Switch

L2/L3 Switch

TRX

TRX

Optical Line System
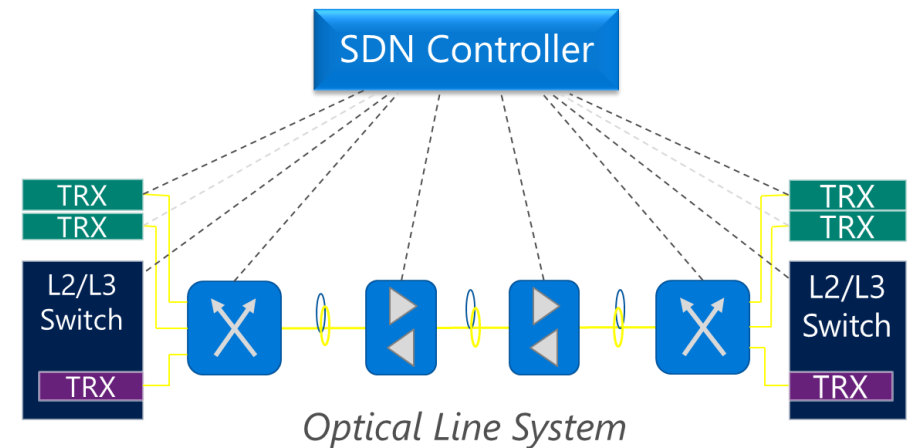
Proposal #1 Details (Peering Router)

- **Features Required**
  - IS-IS
  - Further augment BGP for the edge
    - Community Lists
    - AS-PATH filter
    - Route-Map
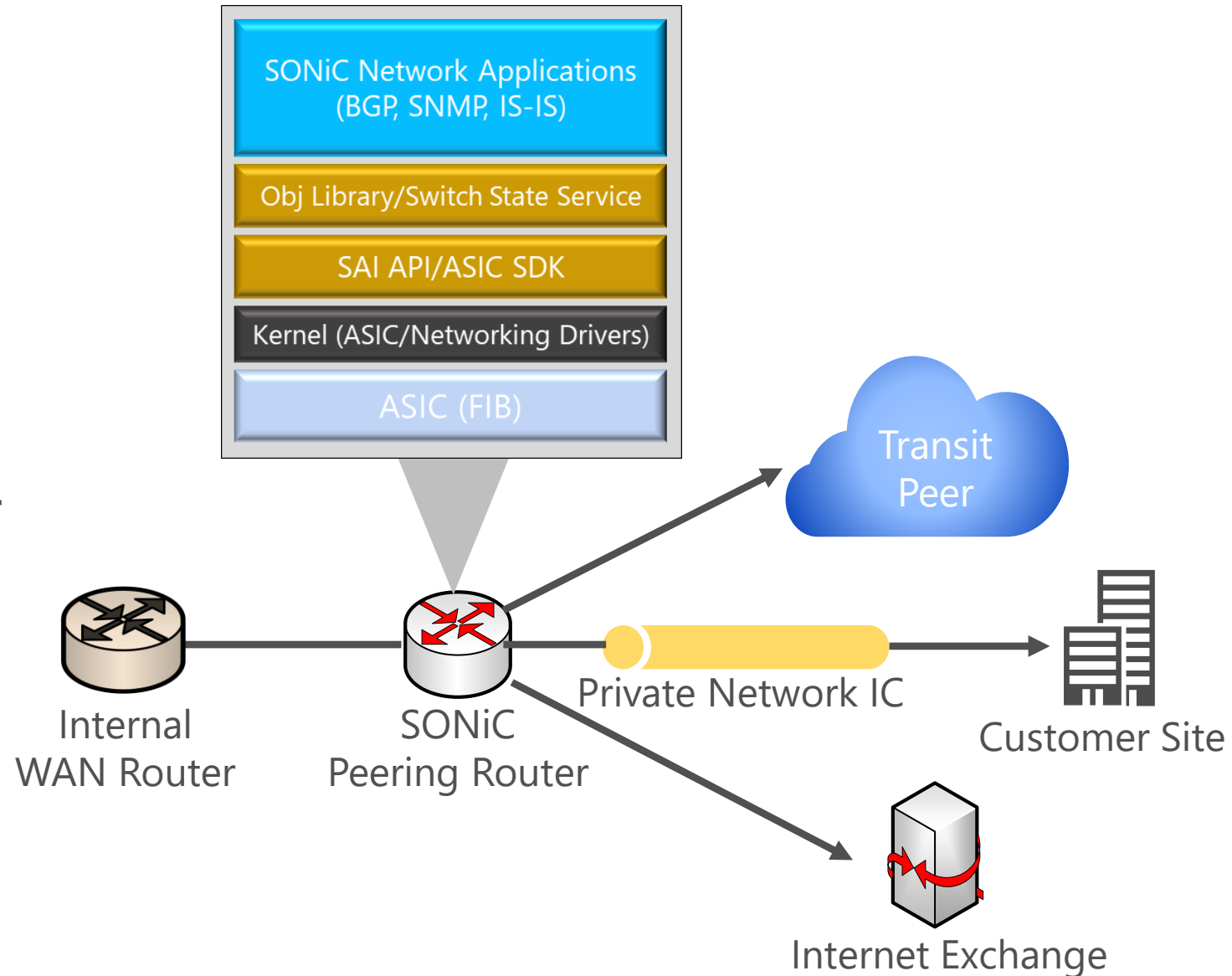 - Large ACL (for edge-facing devices)

- **Further enhancements for expansion of scenario, operational support**
  - Sflow/IPFIX – for traffic measurement
  - Policy Based Routing – to check BGP community before sending

Use-case and Motivation

Usecase & Benefits

- Commodity/ whitebox peering router
- Connect back to Internal WAN
- Box/ASIC vendor agnostic
- Reduced time to market for features
- Scale horizontally w/ programmable framework

SONiC Network Applications (BGP, SNMP, IS-IS)

Obj Library/Switch State Service

SAI API/ASIC SDK

Kernel (ASIC/Networking Drivers)

ASIC (FIB)

Transit Peer

Internal WAN Router

SONiC Peering Router

Private Network IC

Customer Site

Internet Exchange

# Proposal #2 Details (Backbone Router)

- **Features required**
  - Support for multichip/modular devices
  - Full stack MPLS/LDP support (including Segment Routing)– *SONiC + SAI + ASIC implementation*
  - Support of WAN-facing hardware: MACSEC, Open Line System (OLS)
  - Hooks for Cloud-Based SDN Tools and Operations (e.g. Streaming Telemetry, Event-based scripts)

Use-case and Motivation

Usecase & Benefits

- Unified configuration and management (across hardware vendor)

- Agility for defect remediation

- Integrate with Cloud SDN solutions (e.g. for Traffic Engineering)

- Ability to utilize various Network Application containers
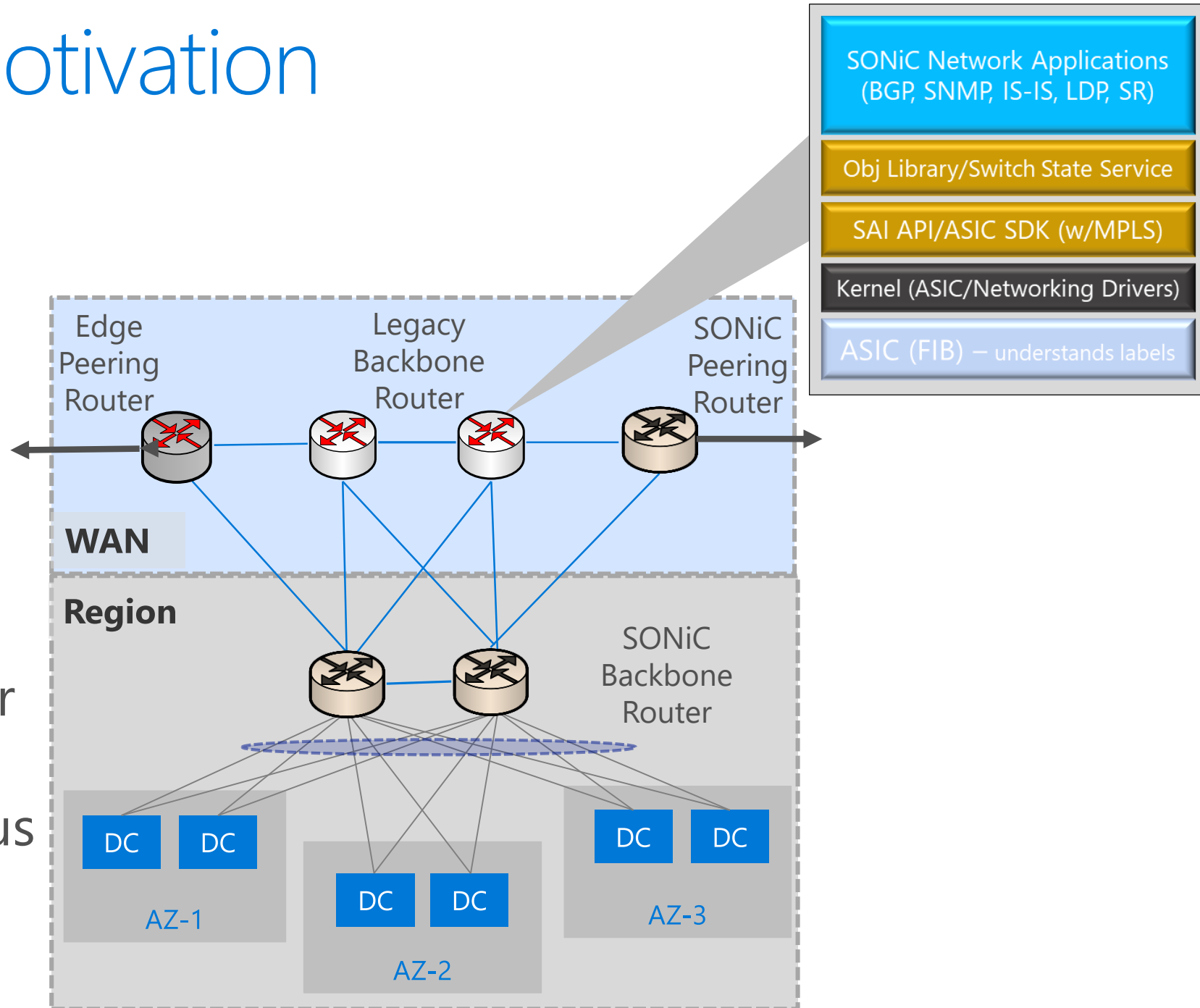
Q & A

Moving Forward: Enabling WAN Scenarios

- Global Network is growing exponentially. We need
  - Agility for fast Time to Market feature release and defect remediation
  - To minimize hardware dependencies
  - To scale and grow the WAN efficiently while controlling costs

- Sonic is an integral element of our Cloud SDN solutions for intelligent traffic management

- Two major roles
  - Edge Peering Router
  - Backbone Router