The Trend to Edge Computing
Diverging Switch Form Factors
David Iles – Mellanox Technologies
Workloads Moving Off Premise
Data Center Ethernet Switch Ports (10G & Above)

Source: Crehan Research and Mellanox Estimates
White Box for Public Cloud

...a mixed bag

- Whitebox Switches Pros
  - Right price
  - Right port count
  - Right NOS

- Whitebox Switch Cons
  - Limited VXLAN scale
  - VXLAN + 100G + Routing
  - RoCE limitations

- Future for Public Cloud
  - 200/400 Gigabit Ethernet
  - COBO – Onboard Optics
  - 277V Power Supplies
  - Large scale tables/tunnels

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**White Box Switches:**
- Right Price
- Right Port count
- Wrong VXLAN scale
- Wrong VXLAN functionality
- Wrong for Machine Learning
- Wrong for NVME Fabrics
Workloads are Moving Around

*VXLAN is the tunnel of choice*
Cloud Connect Acceleration

- Millions of VXLAN tunnels
- 100K Tunnels per switch

Come See The Demo!
Not All Workloads are Moving Off Premise

Hyperconverged Infrastructure (HCI)

“Cloud in a box”
Cloud in your basement
Switches Optimized for On Premise Computing

SWaP = Size, Weight & Power

Partial Rack Design
(10/25GbE downlinks, 100GbE uplinks)

1. 10/25GbE link: SFP28 to SFP28
2. 100GbE Uplink: QSFP28 Transceiver
3. 100GbE MLAG links: QSFP28 to QSFP28
4. 1GbE Transceiver

- ½ 19” width, 1RU height
- 57W typical power
- 18x10/25GbE + 4x40/100GbE
- On-switch Containers

Performance

10G Optimized

25G Ready

Best $/Gb/s

SWaP for On Premise: Small, Fast, Flexible with Management Integration
Edge Computing

What’s the opposite of data center consolidation?

- On-Premise
- Public Cloud
- Edge

- Enterprise Edge
- Media Edge
- IOT Industrial Edge
- Mobile Edge
Edge Computing Projection

By 2020:

50 Billion Devices Connected to the Internet

50% of Data Will be Processed at Network Edge

according to IDC

$1.7 Billion Micro Data Center Market
2015 (just facilities - does not include compute, network, storage)

$6.3 Billion 2020

according to MarketsAndMarkets
What is Driving the Growth?

- Mobile Edge
- Virtual Reality
- Autonomous Vehicles
- Events
- Disasters
- Transportation
- Hybrid Cloud / ROBO
- IoT: Industrial
- IoT: Smart Cities
- Edge / Micro Data Centers
What is a Micro Data Center?

- Small facility placing compute & storage close to users
- Under 1 MW Power
  - Sometimes under 100 KW
- Locations
  - Cell towers
  - Central Offices
  - On-premise / business park / sports arena
  - On Transportation – ships, airplanes, submarines
- Challenges
  - Power, Cooling
  - Limited Space
  - Rapid/Remote Deployment, Zero Touch
  - Ongoing operations/monitoring
Networks Optimized for Edge Computing

SWaP - Size, Weight, and Power Optimized for Micro Data Centers

- Performance
- High Availability
- Simple
- Automated
- Scalable
- Cost Efficient

- 2 Switches in 1RU
- Ultra Low Power <90 watts
- Highly Scalable Data Center Interconnect (DCI)
- Zero Packet Loss & Low Latency
- RoCE optimized switches for NVMe-oF & Machine Learning
- Zero Touch Provisioning
- Network Visibility & Telemetry
- Cost optimized
Protocols vs Telemetry

- Protocols
  - PIM
  - HSRP
  - LACP
  - VPC
  - OSFPv2
  - RIPv2
  - EIGRP
  - SNMP
  - TACACS
  - UFD
  - PVRST/MSTP
  - Private VLAN
  - Loop/Root/BPDU Guard
  - QOS
  - VRRP
  - VTP
  - GVRP
  - IGMP
  - TRILL
  - SPB
  - FabricPath
  - VCS
  - Qfabric
  - BGP
  - FCoE
  - BFD
  - FEX
  - OVSDB/VTEP
  - MLAG
  - QinQ
  - EVPN
  - LACP
  - BGP/BFD

- Telemetry Features
  - SNMP
  - SPAN
  - ERSpan
  - sFlow
  - IPFIX
  - SYSLOG
  - Packet Brokering
  - LLDP
  - sFlow
  - EVPN
  - LACP
  - BGP/BFD
  - TRILL
  - SPB
  - FabricPath
  - VCS
  - Qfabric
  - BGP
  - FCoE
  - BFD
  - FEX
  - OVSDB/VTEP
  - MLAG
  - QinQ
  - Real-time Visibility Snapshots
  - Streaming Telemetry (GPB)
  - Packet Brokering
  - Buffer Histograms
  - Mirror Congestion
  - Mirror Drops
  - Band Telemetry
  - In-situ OAM
  - RoCE Telemetry
  - Watermarks
  - SYSLOG
  - ERSpan
  - SPAN
  - sFlow
  - LLDP

Come See The Demo!
One Unifying Feature: Telemetry

- Exhaustive Packet Drop Counters
  - No mysterious uncounted drops

- In-ASIC Switch Monitoring Tool
  - Bandwidth & queue depth over time
  - Microsecond sampling
  - Hardware generated histograms
    - Per port bandwidth (tx/rx)
    - Per port delays from flow control
    - Per queue monitoring

Hardware checked the queue 5000 times in the last second

Here’s how many times the queue was at 10% utilization:
Histograms – a Tool for Analysis

They are not just for shopping online
In Band Telemetry

- In-band advanced notifications
  - Monitor network, Detect anomalies
  - IP/TCP/GENEVE/VXLAN options
  - Notify about
    - Switch ID
    - Egress port
    - Egress queue
    - Queuing bytes
    - Queuing latency
    - Time stamp

- Passive in-band telemetry
  - DSCP coloring according to ingress time
  - Count drops on specific flows across fabric
  - Monitor end-to-end high-latency
Thank You