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Whitepaper

25Gb Ethernet: The Path to 100GbE with Optimal TCO for the Enterprise

Boasting a 2.5x performance increase, 100% better cost per gigabit, and optimized power consumption, 25Gb Ethernet is the new networking standard for optimal TCO.

Executive Summary

The relentless improvements of technology continue to drive new opportunities for leading companies to deliver new and better goods and services. 25Gb Ethernet networking is but the latest example of a new technology whose time has come. Like the transition from 1GbE to 10GbE, 25GbE has turned the corner on positive TCO. No less compelling is the increased performance, empowering a new generation of innovation for products and services. And the transition has happened much more quickly than ever before.

Supermicro offers total server and storage solutions leveraging 25Gb Ethernet. With a comprehensive portfolio of NIC and switch products based on Intel, Mellanox and Broadcom silicon in multiple form factors (PCI-E, SIOM, Ultra, MicroLP and more), the Supermicro solutions can be configured for optimal cost and performance. They are 100% compatible and have gone through the highest testing protocols to ensure trouble-free operation. They support advanced features, not offered by other vendors including NC-SI, Asset Management, thermal sensor monitoring.

2.5x

**Network
Performance**

2.5x

**Performance
per Watt**

100%+

**Better Dollar
per Gig**

50%

**Higher Port
Density**

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The Benefits of 25Gb Ethernet

With the latest generation processors and NVMe SSDs, applications demand faster I/O than ever to exchange data across fabrics efficiently. Customers are often left with limited options including the installation of multiple 10GbE NICs on density optimized servers where PCI-E slots are often found scarce, and then forced to deploy more cables and switches. Based on the latest pricing (March 2018), the *cost per gigabit* of 10GbE can be more than 100% higher than the one of 25GbE. A single 25GbE lane offers 2.5x the bandwidth of a 10GbE lane, while also future-proofing the system and conserving precious PCI-E slots reserved for storage and others uses.

With compelling cost proposition – 25GbE NICs cost approximately 15% more than 10GbE NICs, a price that is likely to continue to decline, giving 2.5 times the bandwidth and a very modest cost increase – the decision to embrace this technology is easy, if not compelling.

The growth in the deployment of 25GbE ToR switches and SFP28 cabling in recent datacenter refreshes is also driving the demand for 25Gb Ethernet. To ensure critical applications can sustain the future growth of business while maintaining existing SLAs, customers are planning ahead to expand their switching capacities at the aggregation and core layers by upgrading from 10GbE to 25GbE and 100GbE today. Once a 25GbE infrastructure is in place, customers can benefit from the agility to invest in 25GbE NICs as their business grow with minimal risks of any prolonged downtime. Moreover, since 25GbE NICs are backwards compatible with 10G standards and SFP28 is compatible with SFP+ ports, an upgraded 25GbE infrastructure can accommodate both 10GbE and 25GbE NICs in the same network, hence ensuring a smooth transition with maximum flexibility.

25GbE Workloads

New innovations are also stressing networking bandwidth beyond 10GbE. Autonomous Vehicles, AI, Machine Learning, and Big Data applications rely on a distributed computing model made possible by high-speed networking. Coupled with increased system performance, 25GbE can help businesses to deliver new innovations to the market faster by smarter machines and bigger data.

25Gb Ethernet meet the expanding performance requirements in a number of applications: web centric (e-commerce) business models always drive demand for more network bandwidth; HPC, distributed applications and clustered database need high performance networks as well; and NVMe over Fabric (NVMe-oF) will benefit significantly from the higher bandwidth provided by 25GbE NICs.

As an example, the database team of a major retailer maintains several internal applications - a warehouse management / customer delivery software and a SAP/Oracle database – the user experience is heavily dependent on networking performance. As soon as they upgraded to 25GbE they immediately saw better application response times and higher number of transactions processed per second.

The latest Intel® processor refresh to the Intel® Xeon® Scalable processor family is also driving faster adoption of 25Gb Ethernet. Customers anticipate that the increasing computing capability (yielding more workload per server) will require higher speed network connectivity. And since customers prefer allocating only one PCI-E slot for a NIC, 25GbE becomes the ideal choice with 2.5x bandwidth and lower cost per gigabit than 10G. On top of that, a concurrent network upgrade in the ToR switches will just make the change more compelling.

25GbE is more than a TCO strategy. As memory, CPUs and storage performance increases, the demand for increased network capacity follows naturally.

25GbE Compatibility and Transition to 100GbE

	10GbE	25GbE	40GbE	100GbE
# of PCI-E 3.0 lanes (single-port)	2	4	8	16
# of PCI-E 3.0 lanes (dual-port)	4	8	16	32
Clock rate	10.31 GHz	25.78 GHz	10.31 GHz	25.78 GHz
Single-lane speed (SerDes)	10Gb/s	25Gb/s	10Gb/s	25Gb/s
#of Lanes per port (SerDes)	1	1	4	4
Connector	SPF+	SFP28	QSFP	QSFP28
DAC cable	Thin	Thin	Bulkier	Bulkier
Cable cost	Low	Low	High	High
Easy transition to 100GbE	-	Yes	No	-

25GbE provides a smooth transition from existing infrastructure and a long-term path to a seamless 100GbE transition.

Key Benefits of 25GbE

- *2.5x faster single lane performance than 10Gb Ethernet*
- *Superior switch port density for better scalability*
- *Reduce CAPEX from fewer ToR switches and cables*
- *Reduce OPEX from lower power, cooling and smaller footprint*
- *An easy and clear future upgrade path to 100GbE networks.*

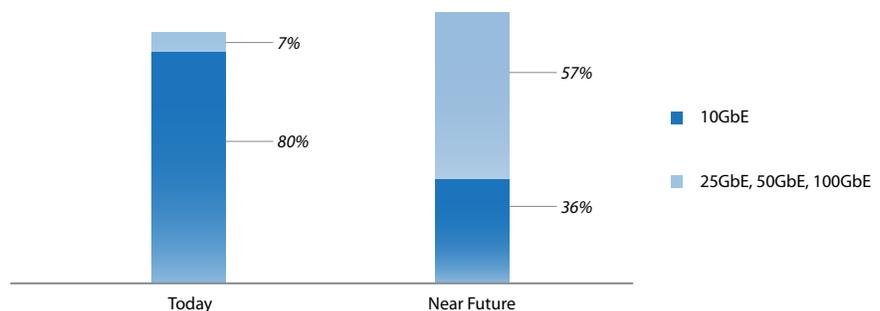
25GbE Transition

- 25Gb Ethernet is implemented with 25Gb SerDes providing 2.5x the single-lane bandwidth than 10Gb SerDes.
- 25Gb Ethernet provides higher port and system density compared to 40Gb with a lower CAPEX from fewer ToR switches and more expensive cabling.

Path to 100G

The IEEE has defined the 100Gb Ethernet standard based on four 25Gb lanes in contrast to the less efficient ten 10Gb lanes standard. The success of 100Gb Ethernet in datacenter networks for inter-switch links will drive 25GbE adoption and scale as a reliable and cost-effective technology.

Growth of High Speed Networking



The Economics of 25Gb Ethernet

The economics have begun to strongly tip towards 25Gb Ethernet. The acquisition cost which is at around a 15% premium will future-proof the datacenter for years to come, but the cost per gigabit as well as the efficiencies surrounding ToR density deliver the real value of 25GbE. The cost per gigabit for 10GbE is 100% higher than 25GbE.

SFP+ vs SFP28

Acquisition Cost of 25GbE vs 10GbE

	10GbE	25GbE
Per NIC port	\$125	\$140
Per meter of DAC cabling	\$20	\$30
Per ToR switch port	\$125	\$90
Total	\$270	\$260

Cost Per Gigabit

The cost per gigabit is significantly improved with 25GbE since we are delivering 2.5x more performance with only a minimal acquisition cost increase. Using the acquisition cost above leads to a 113% higher cost per gigabit for 10GbE versus 25GbE.

	10GbE	25GbE
Performance (gigabit/s)	10	25
Cost per port	\$145	\$170
Cost per gigabit	\$14.5	\$7

Supermicro 25GbE Solutions

SSE-C3632S/R



- 40/100Gb Ethernet Bare Metal ToR Switch
- 32x 40/100Gb QSFP28 Port (expandable to 4x10GbE or 4x25GbE ports for each QSFP28 port)

SSE-F3548S/SR



- 48 ports 25GbE SFP28
- 6 ports 100GbE QSFP28 (expandable to 4x10GbE or 4x25GbE ports for each QSFP28 port)

SBM-25G-100 (SuperBlade®)



- Power Optimized Switch
- Downlinks: 20x 25/10/1GbE
- Uplinks 4x 40/100GbE QSFP28
- Native sFlow support in CPU for traffic monitoring and analysis

ToR Switches

Supermicro offers two top-of-rack switches optimized for 25Gb Ethernet. The flagship 100GbE switch – SSE-C3632S – can be configured for up to 128x 25GbE connections with each of its QSFP28 100GbE ports split by four using QSFP28 to SFP28 breakout cables. The new SSE-F3548S offers an extremely cost competitive option for standalone 25GbE switching – 48x SFP28 downlink ports for 25GbE and four QSFP28 100GbE uplinks ports which could, in fact, also be split by four to give as many as 64 connections at 25GbE – at a fraction of the cost of the 100GbE alternative.

All Supermicro's 25GbE products are backward compatible with 10GbE. This offers great deployment flexibility for businesses only starting to invest in a 25GbE networking infrastructure. Customers can install these new switches today and operate with existing 10Gb Ethernet infrastructure; when the time to upgrade to 25GbE comes, it is merely a configuration update – no need for any prolonged downtime.

New Generation 8U/6U SuperBlade® Solutions

Supermicro X11 SuperBlade systems support various networking fabrics including 25Gb Ethernet. The 25Gb Ethernet switch (SBM-25G-100) is a part of the portfolio of SuperBlade switch modules, and can be deployed in either the 8U SuperBlade enclosure (SBE-820J) or the 6U SuperBlade enclosure (SBE-610J).

This switch (SBM-25G-100) features twenty 25Gb Ethernet downlink connections, four QSFP28 ports where each port can be configured as 40/100Gb Ethernet uplink connections. Using breakout cables, individual 40GbE ports can be split into 4x 10GbE, or each 100GbE port can be split into 4x 25GbE ports.

Like the standard 25GbE ToR switch, the blade switch auto-negotiates and is compatible with 10GbE networking, providing customers a clear path to future 25GbE upgrade to their existing datacenter infrastructure. Customers who are familiar with the Blade networking management interface of MBM-XEM-002/MBM-XEM-GEM-004 will benefit from using similar GUI/CLI interface with the new 25GbE switch. Additionally, it supports the latest networking protocols required for today's datacenter and cloud infrastructure environments.

25GbE Mezzanine Card for SuperBlade

There is a 25Gb Ethernet mezzanine card (AOC-25G-X4D) that is specifically intended to interface with the X11 SuperBlade server. The card supports the latest networking features that include Physical Functions, SR-IOV, RDMA/RoCE, DPDK, packet pacing, flow steering and Ethernet offloads.

AOC-25G-6X4D



AOC-25G-X4D



25GbE Mezzanine Card for X11 SuperBlade

- PCI-E Gen3 x8
- Latency 0.71 us
- Power 7.4 W
- Supports RDMA/RoCE
- Supports DPDK
- 75 Million packet per second
- Virtualization 32xPFs; 254xVFs
- Packet pacing

Supermicro 25GbE/100GbE NICs

	Broadcom [®] BCM57414 / BCM57454		Intel [®] XXV710	Mellanox [®] ConnectX ⁻⁴		
Standard PCI-E	<p>AOC-S25G-b2S 2 SFP28</p>	<p>AOC-S100G-b1C* 1 QSFP28</p>	<p>AOC-S25G-i2S 2 SFP28</p>	<p>AOC-S25G-m2S 2 SFP28</p>	<p>AOC-S100G-m2C 2 QSFP28</p>	
SIOM	<p>AOC-MH25G-b2S2G 2 SFP28, 2 RJ45 i350</p>		<p>AOC-M25G-i2S 2 SFP28</p>	<p>AOC-MH25G-m2S2T 2 SFP28 and 2x 10GBase-T</p>	<p>AOC-M25G-m4S 4 SFP28</p>	<p>AOC-MHIBE-m1CG 1 QSFP28 and 1 GbE</p>
Ultra Riser	<p>AOC-2UR68-b2TS* 2U Ultra, 2 SFP28</p>	<p>AOC-URN4-b2TS* 1U Ultra, 2 SFP28</p>	<p>AOC-URN4-i2TS 1U Ultra, 2 SFP28</p>	<p>AOC-2UR68-m2TS 2U Ultra, 2 SFP28</p>	<p>AOC-URN4-m2TS 1U Ultra, 2 SFP28</p>	
Other Form Factors	<p>AOC-B25G-X4D 8U SuperBlade[®]</p>	<p>AOC-B25G-6X4D 8U SuperBlade[®]</p>		<p>AOC-C25G-m1S X10 FatTwin (1 SFP28)</p>		

* In Planning and Development

Supermicro Systems Optimized for 25GbE

	Ultra	BigTwin	FatTwin	TwinPro	SuperBlade	Storage	Other
	X11/X10 2U/1U	X11/X10	X11/X10	X11/X10	X11 8U/6U	X11/X10 24/48/45/60/90 Bay and SBB	Any System Supporting PCI-E 3.0 x8
Standard PCI-E	Yes	Yes	Yes	Yes		Yes	Yes
SIOM		Yes	Yes (X11 only)	Yes		Yes	
Ultra Riser	Yes						
MicroLP			Yes (X10 only)				
SuperBlade					Yes		

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