Data centers 2020

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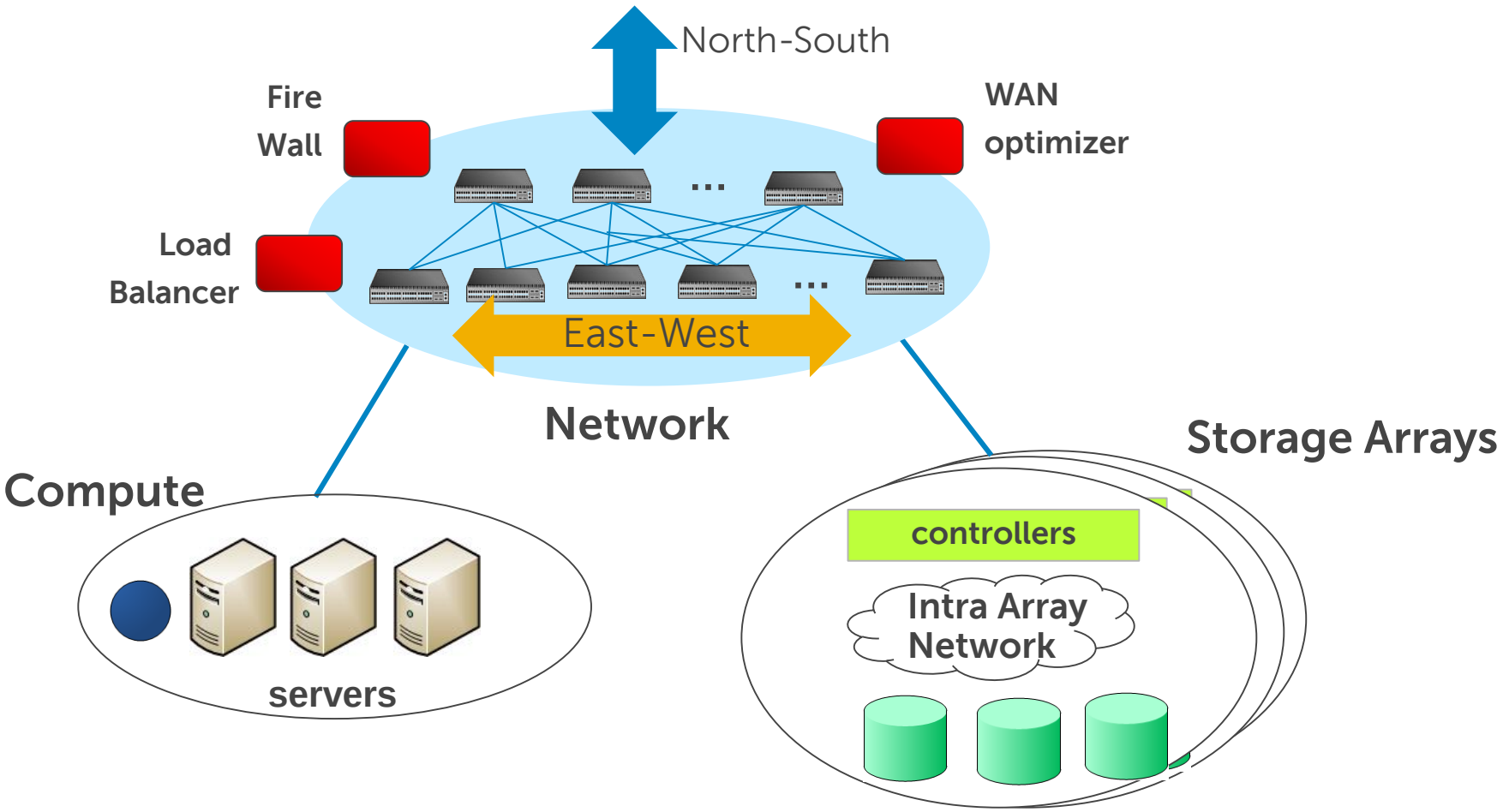
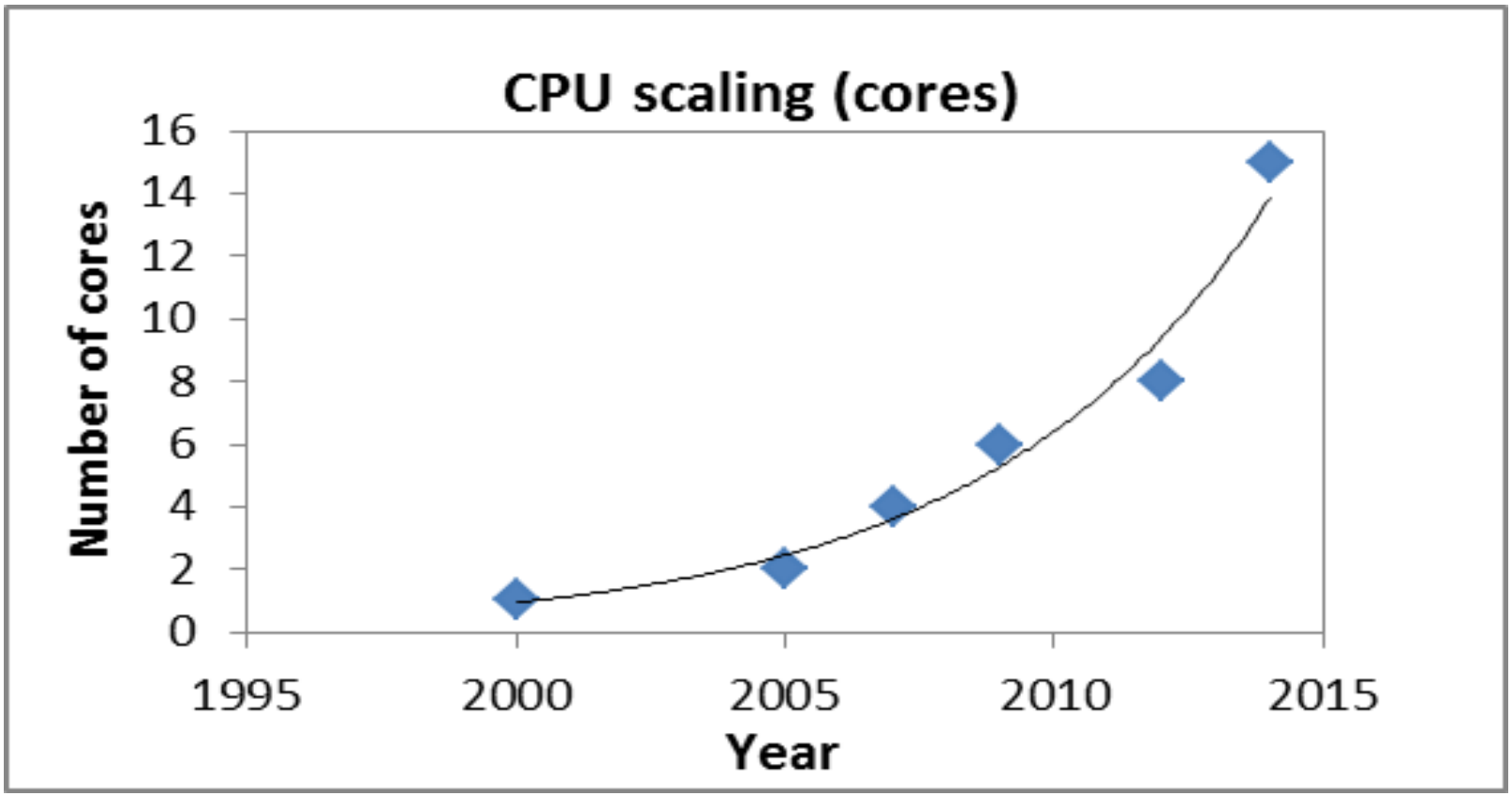
Data Centers - Today

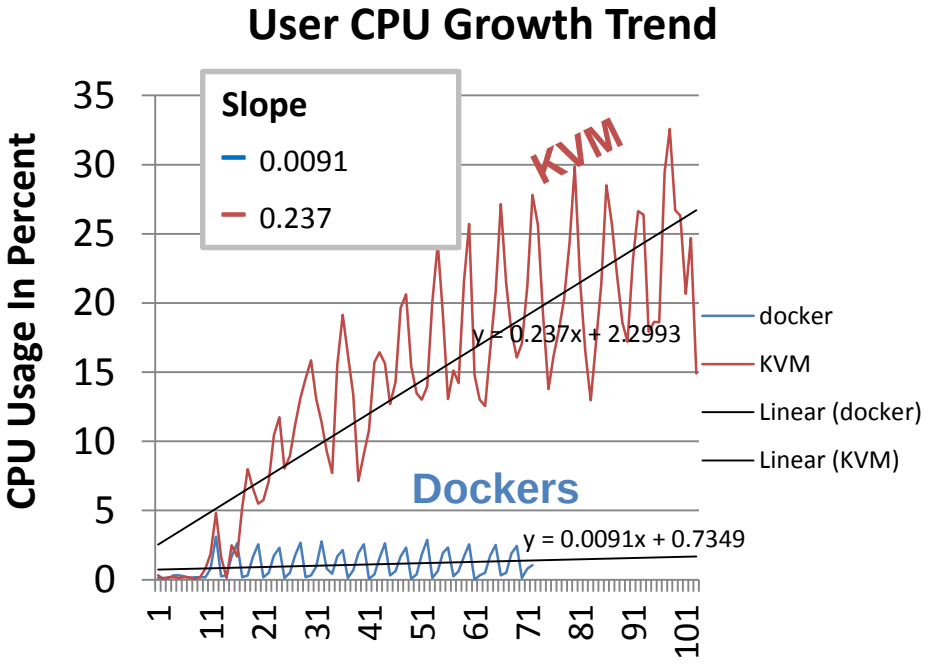


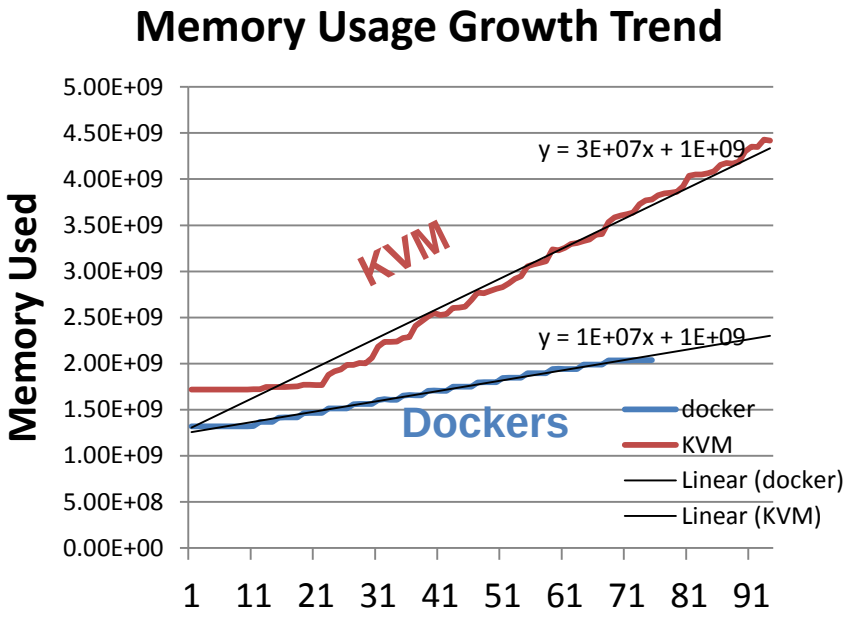
End-point trends

- CPU scaling via multi-core



End-point trends – Dockers/Linux Containers



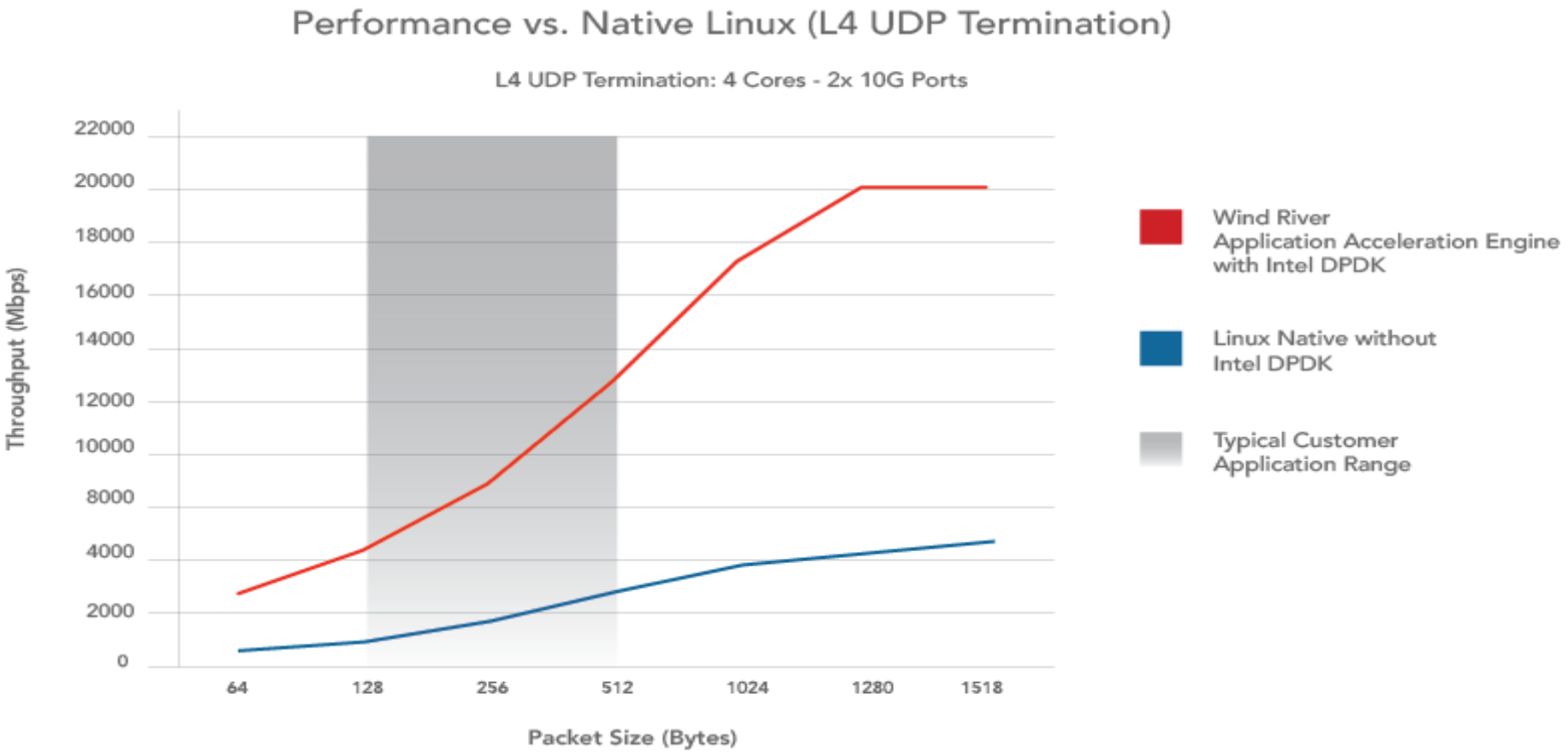


- Docker LXC density potential compared to VMs
  - 3x memory savings
  - 26x CPU savings
  - 3.22x smaller images in this test (note – image sizes can vary based on required packages)

*http://www.slideshare.net/KrishnamurthySubramanian/savedfiles?s_title=kvm-and-docker-lxc-benchmarking-with-openstack&user_login=BodenRussell

High Performance Platform for Virtual Networking Functions

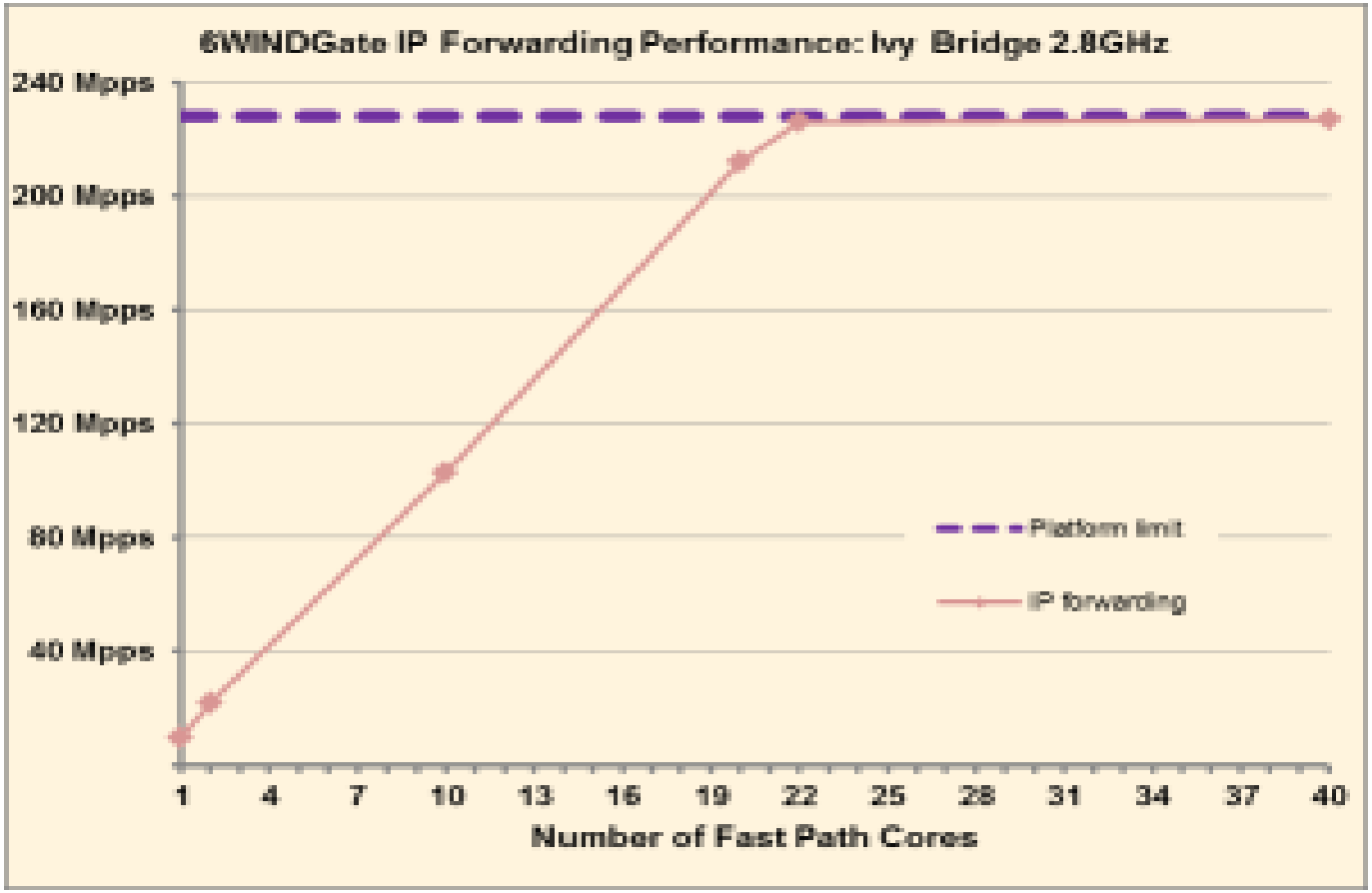
UDP Termination Performance



http://www.windriver.com/announces/intelligent-network-platform/

High Performance Platform for Virtual Networking Functions

6WindGate IP Forwarding Performance – 228 Mpps

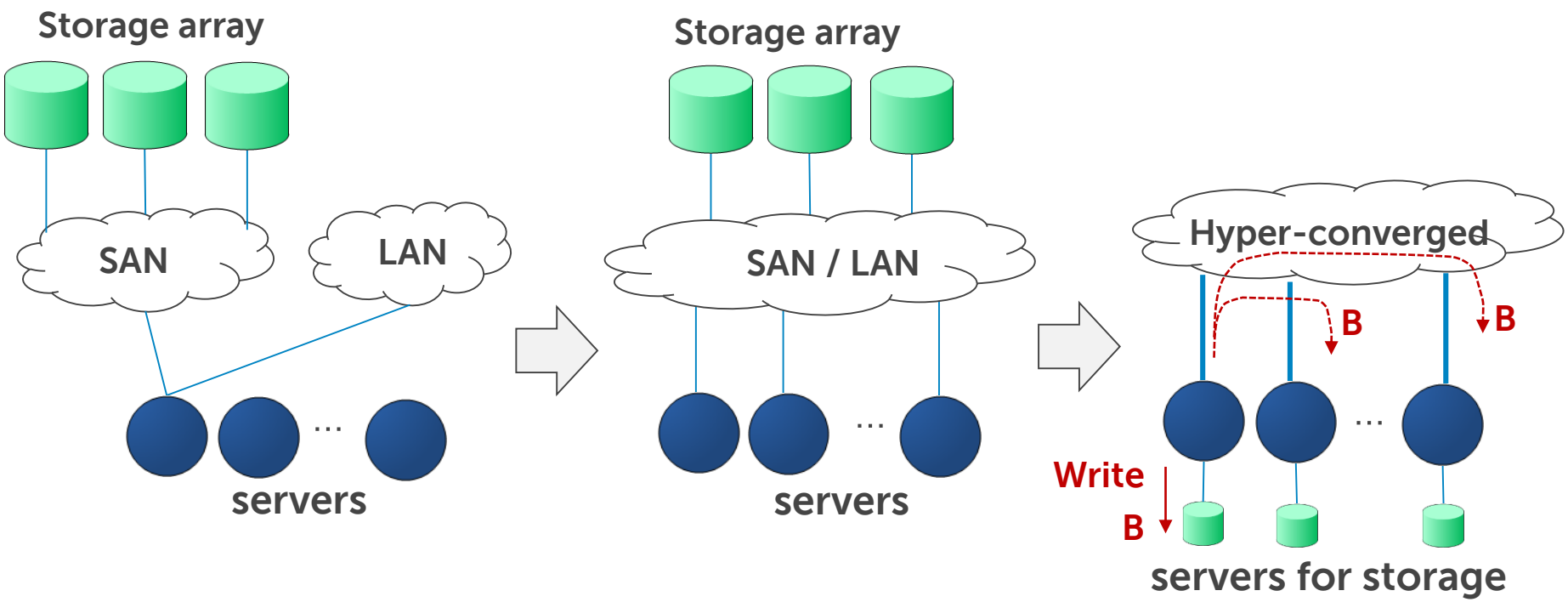


http://www.6wind.com/products/6windgate-processor-architectures/intel-platform-support/

Storage trends

- Storage becomes software running on servers
  - General purpose CPUs as opposed to custom processors
- Storage distributed in servers as opposed to centralized arrays
  - Add a server to add more storage (scale-out)
- Flash caching, tiering and de-dup are a key part of storage software capabilities
- Higher performance persistent memory is emerging. Latency < 300ns (PCM, STT MRAM, RRAM)
- Storage is managed as part of virtual infrastructure and VM management.

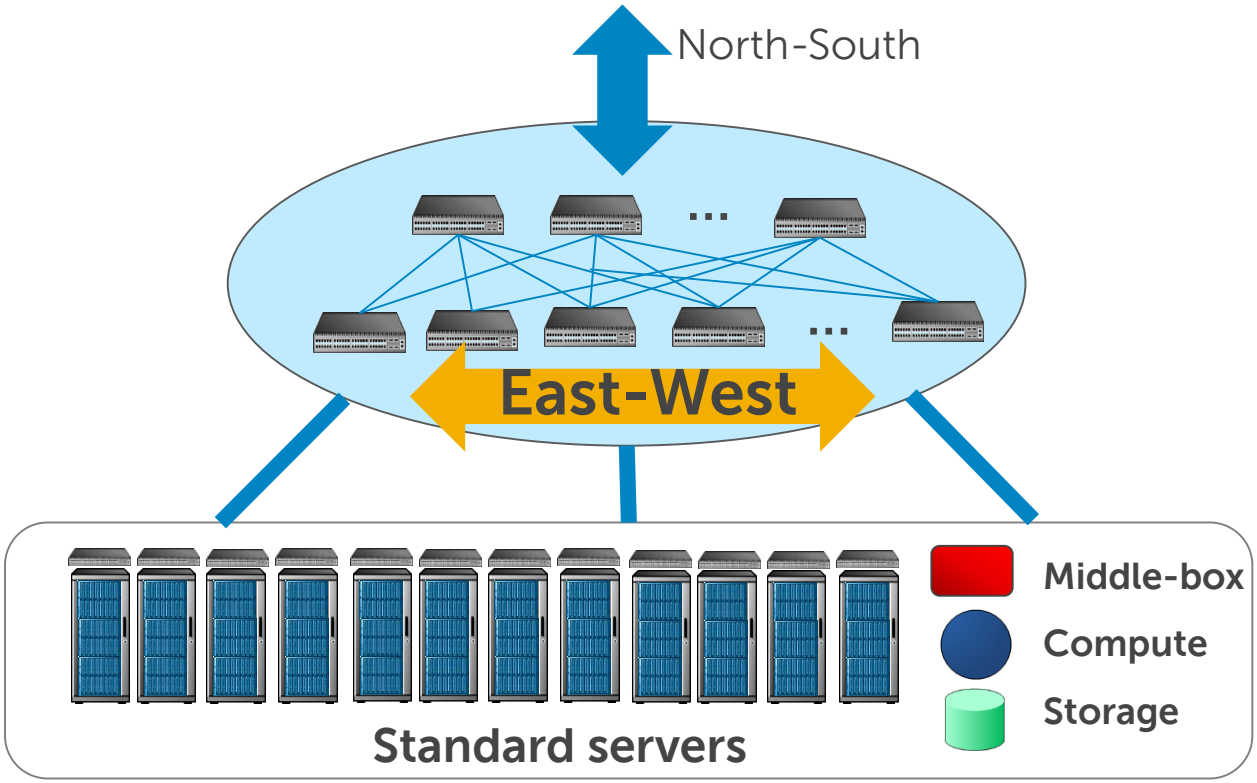
Storage trends



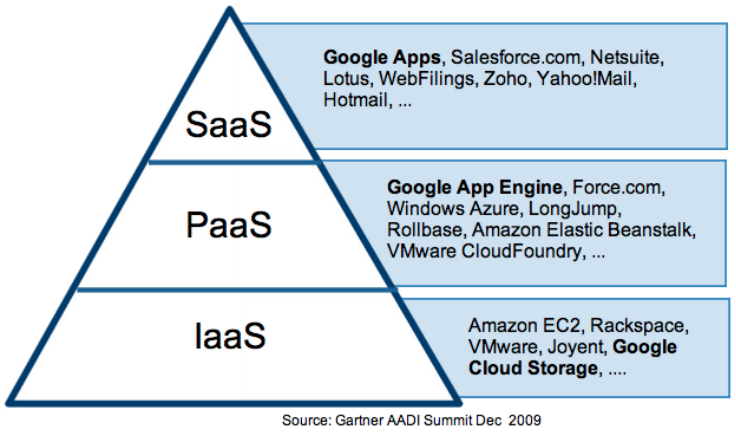
- Impacts link bandwidths at all layers
- Larger server I/O to handle added traffic
  - Higher throughput, reduced latency
- Storage traffic carried East-West across network
  - Data read/write, caching, replication, rebuild after failure, re-balance, etc.

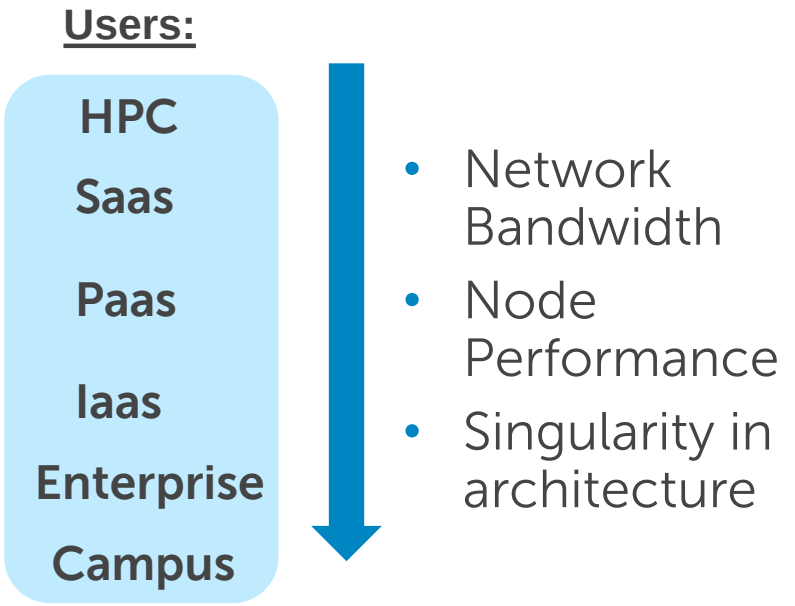
Data Center convergence - Future

- Compute-storage-middle-box functions in standard servers
  - Leverage economics of common component (server) architecture
- Will drive higher link bandwidths at every layer (400G in network)



Different adoption rates





- User adoption / needs differ
  - HPC will adopt higher speed when available
  - Cloud wants optimized solutions at regular intervals
  - Enterprise - slower upgrade cycles, multi-generational inter-op

Open Networking

Traditional networking

- Proprietary architectures & mgmt tools
- Hundreds of protocols
- Proprietary networking OS
- Proprietary ASICs

Silicon
+
System Vendors
+
Open Source Apps
+
Independent Software Vendor Apps

Tomorrow's Networking

- Standard orchestration and automation tools
- Optional 3rd party SDN / NVO controller
- Virtual services
- Power and traffic optimization app
- Performance monitoring opt app
- Security
- Open network platform OS
- Open standard hardware
- Merchant silicon

Network should not get in the way

- Software: L3 based network - route as soon as you can
- Hardware (Want | Reality)
  - › Non-blocking network
  - › Cost-effective Parallel and Duplex optics aligned to DC switch roadmap
  - › 3:1 @ ToR for cost
  - › Generally true for parallel solutions, not so for duplex SMF / MMF

.	TODAY	-- NEXT GENERATIONS --		
SERDES	10Gb/s	25Gb/s	50Gb/s	100Gb/s
OPTICAL	10Gb/s (4 lambdas/fibers)	25Gb/s (4 lambdas/fibers)	25/50/100G ?	100Gb/s
SPEED	40GE	100GE	100/400GE	400GE

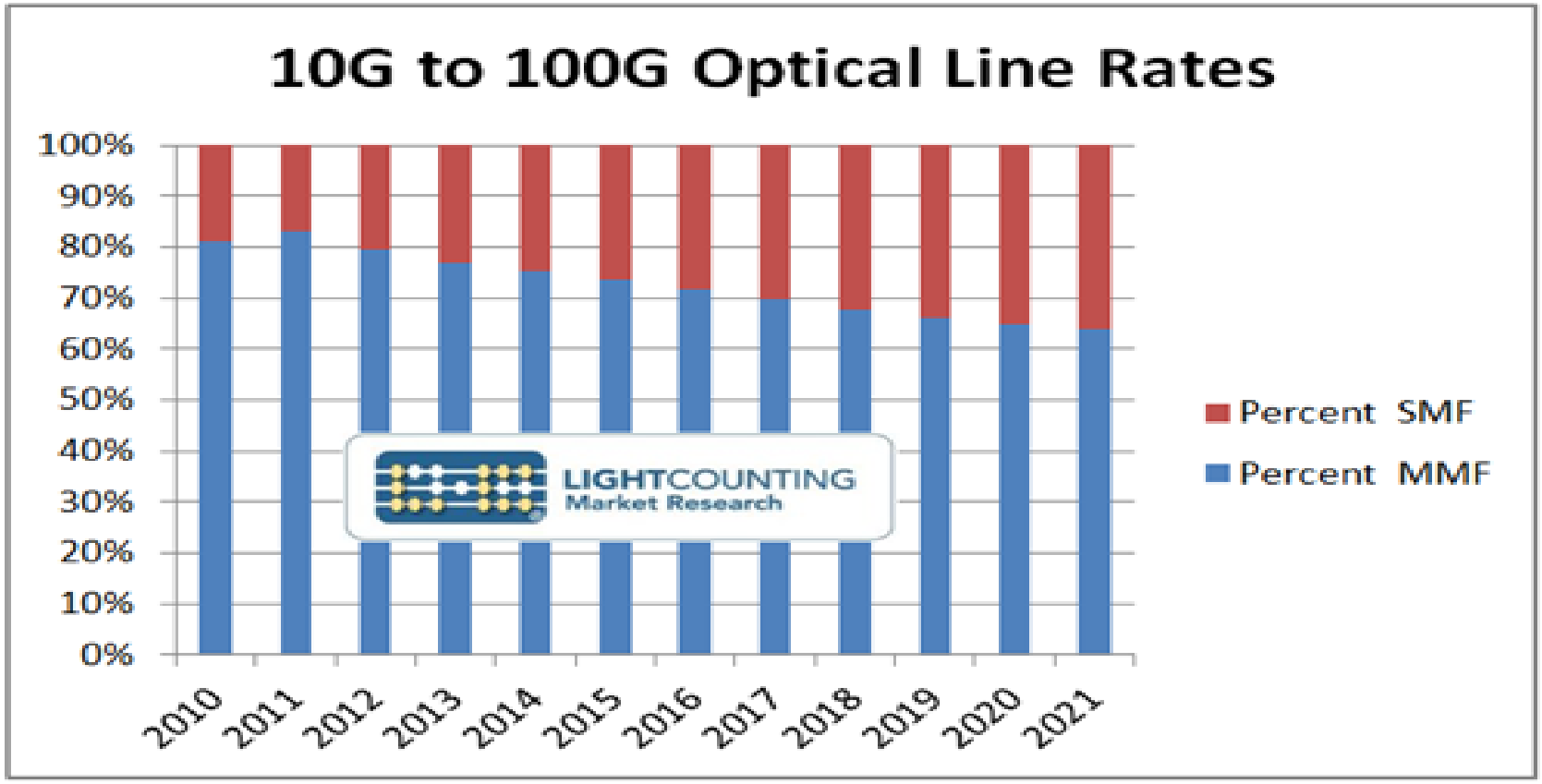
Single optical solution vs. multiple

- **One optical solution while electrical interface evolves**
  - 100G-serial optical | 4x100G lambdas for 400GE
  - Interop between generations
  - Challenges – who will make early investments, what if Gen1 modules are costly, who will buy these…?

- **New optical solution for each electrical interface gen.**
  - 4x25G → 2x50G → 1x100G-serial for 100GE
  - 8x50G → 4x100G lambdas for 400GE
  - Lower investment and risk, potentially, at each point
  - Challenges - Interop; need to design in previous generation modules in each new generation of product

Need holistic view

- Data-centers use both MMF and SMF transceivers (more MMF)
- Should we move to SMF for 100g lamdas?



Courtesy: LightCounting

Challenge to the industry

- Applications are coming to increase bandwidth.
- Open Networking will increase speed of innovation and product delivery.
- Industry needs to take into account a DC view also given bandwidth growth in the DC.
- **Take risks and push hard on the technology.**