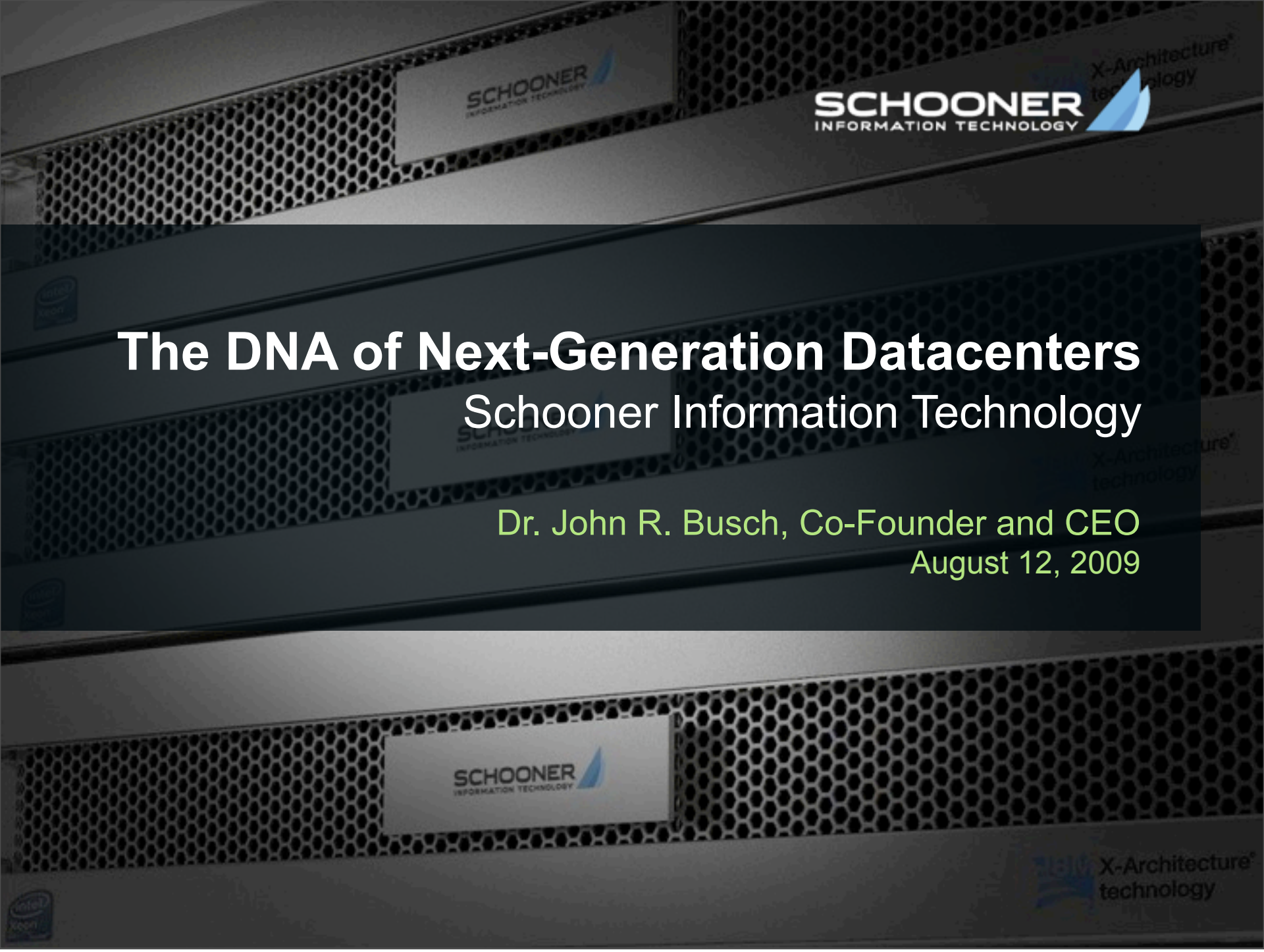


The DNA of Next-Generation Datacenters

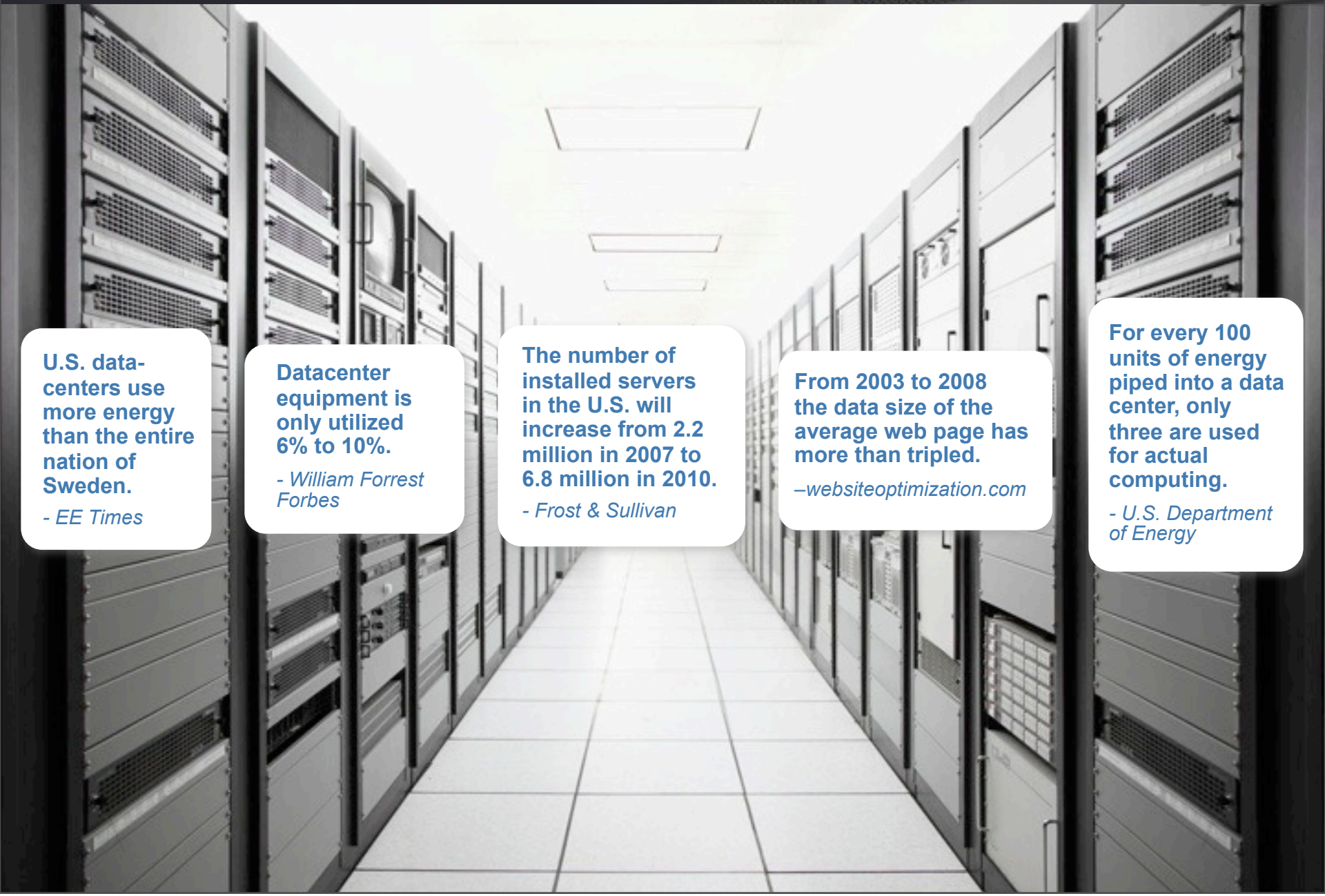
Schooner Information Technology

Dr. John R. Busch, Co-Founder and CEO

August 12, 2009

Too Much Rack, Power, Pipe, Complexity

SCHOONER INFORMATION TECHNOLOGY



U.S. data-centers use more energy than the entire nation of Sweden.

- EE Times

Datacenter equipment is only utilized 6% to 10%.

- William Forrest Forbes

The number of installed servers in the U.S. will increase from 2.2 million in 2007 to 6.8 million in 2010.

- Frost & Sullivan

From 2003 to 2008 the data size of the average web page has more than tripled.

–websiteoptimization.com

For every 100 units of energy piped into a data center, only three are used for actual computing.

- U.S. Department of Energy

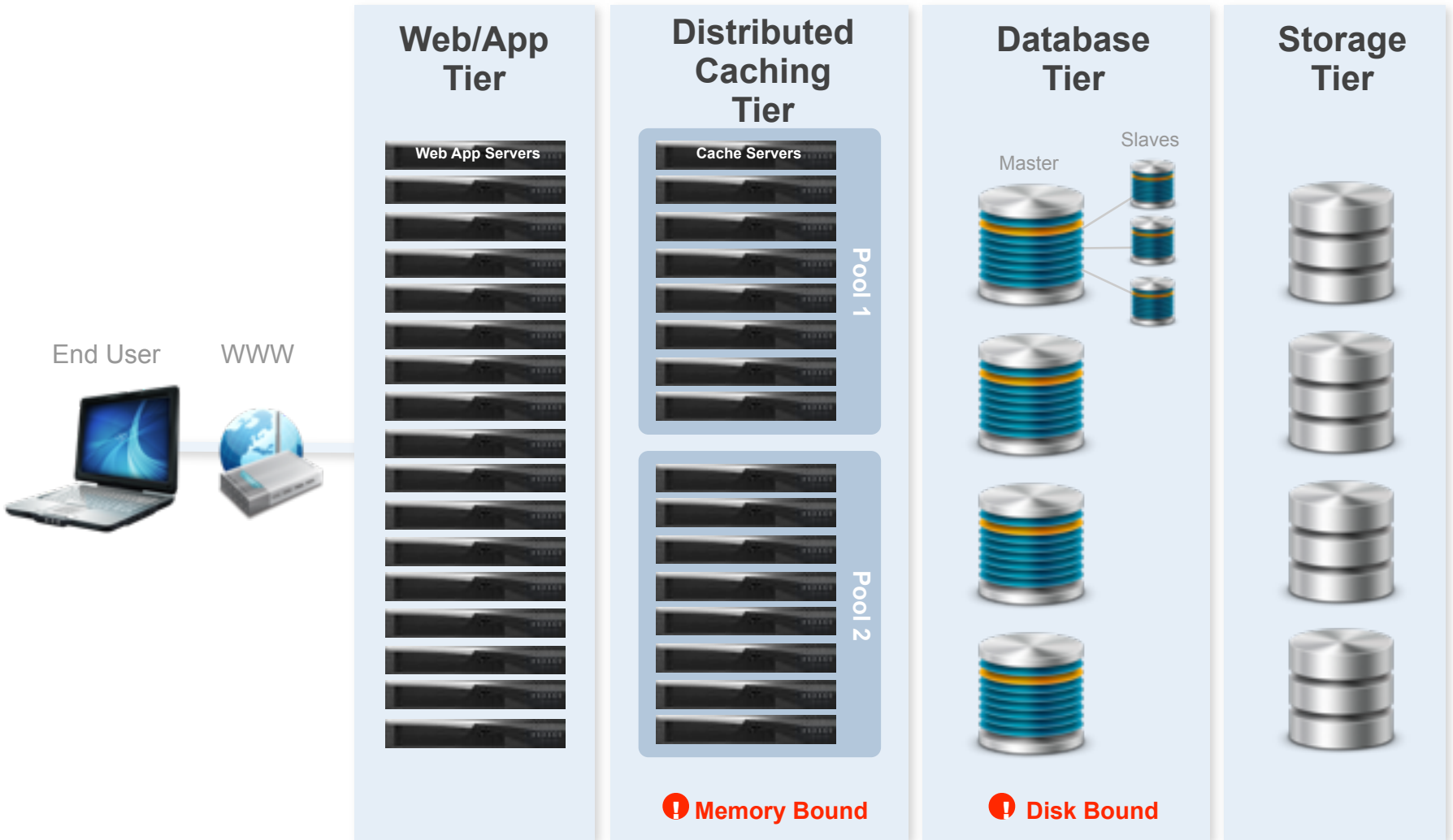
Computing Trends and New Technologies

SCHOONER INFORMATION TECHNOLOGY

Four transformational technologies:

- Multi-core processors
- State-of-the-art, enterprise-class flash memory
- Low-latency interconnects
- Optimized data access and caching applications

Typical Web 2.0 and Cloud Deployment



Loosely Coupled Architectures

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Application and administrator managed scale-out:

- Add more commodity boxes, GbE, storage to support growing workload
- Applications must provide partitioning, parallelism, concurrency control, replication, and recovery
  - Complex development, integration, re-partitioning
- Exploiting multi-core, flash and low latency interconnect is a customer by customer problem
  - Effectively a research project
  - Ineffective results to date: single-digit utilization

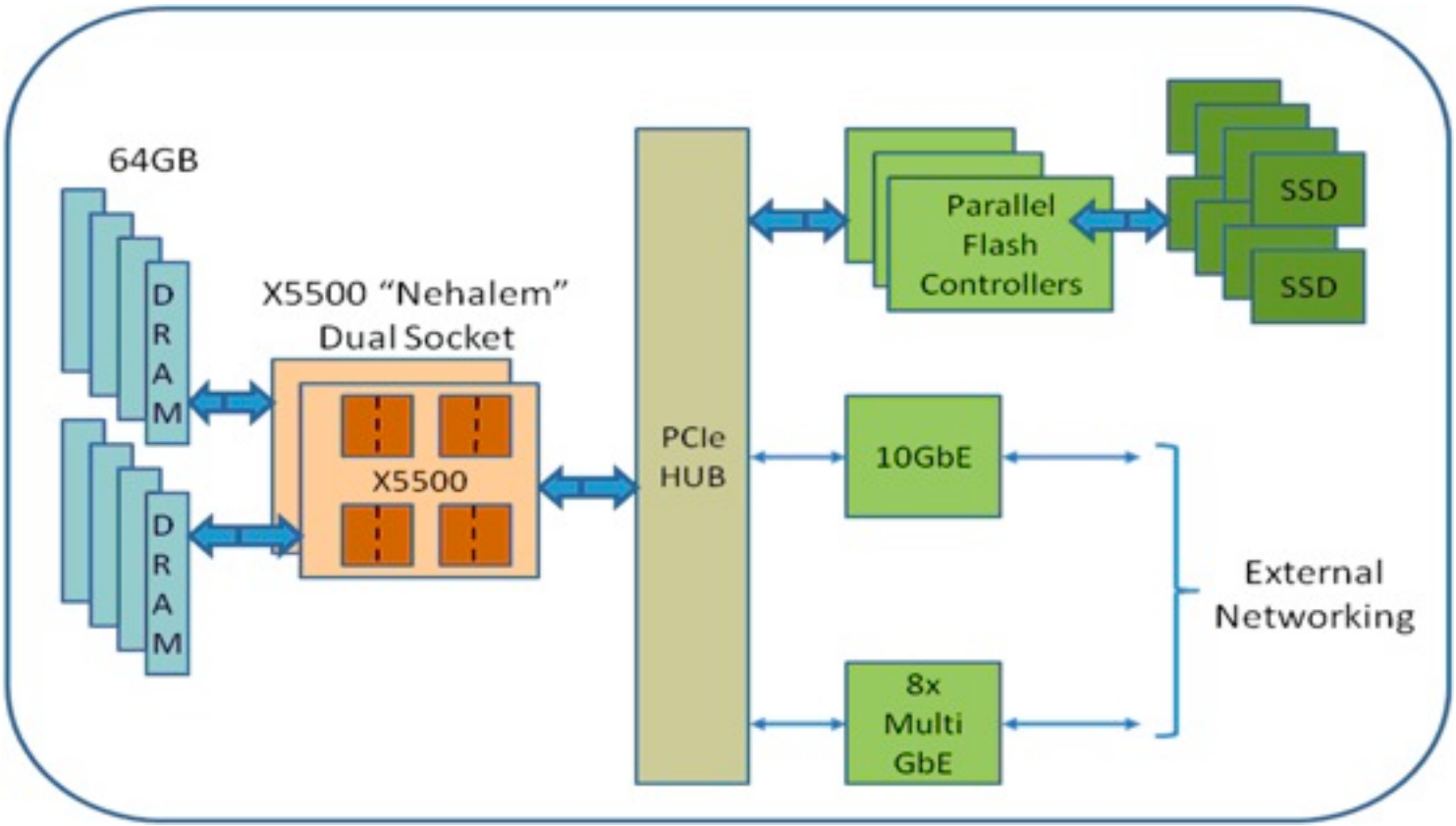
Future Trend: Tightly Coupled Building Blocks

SCHOONER INFORMATION TECHNOLOGY

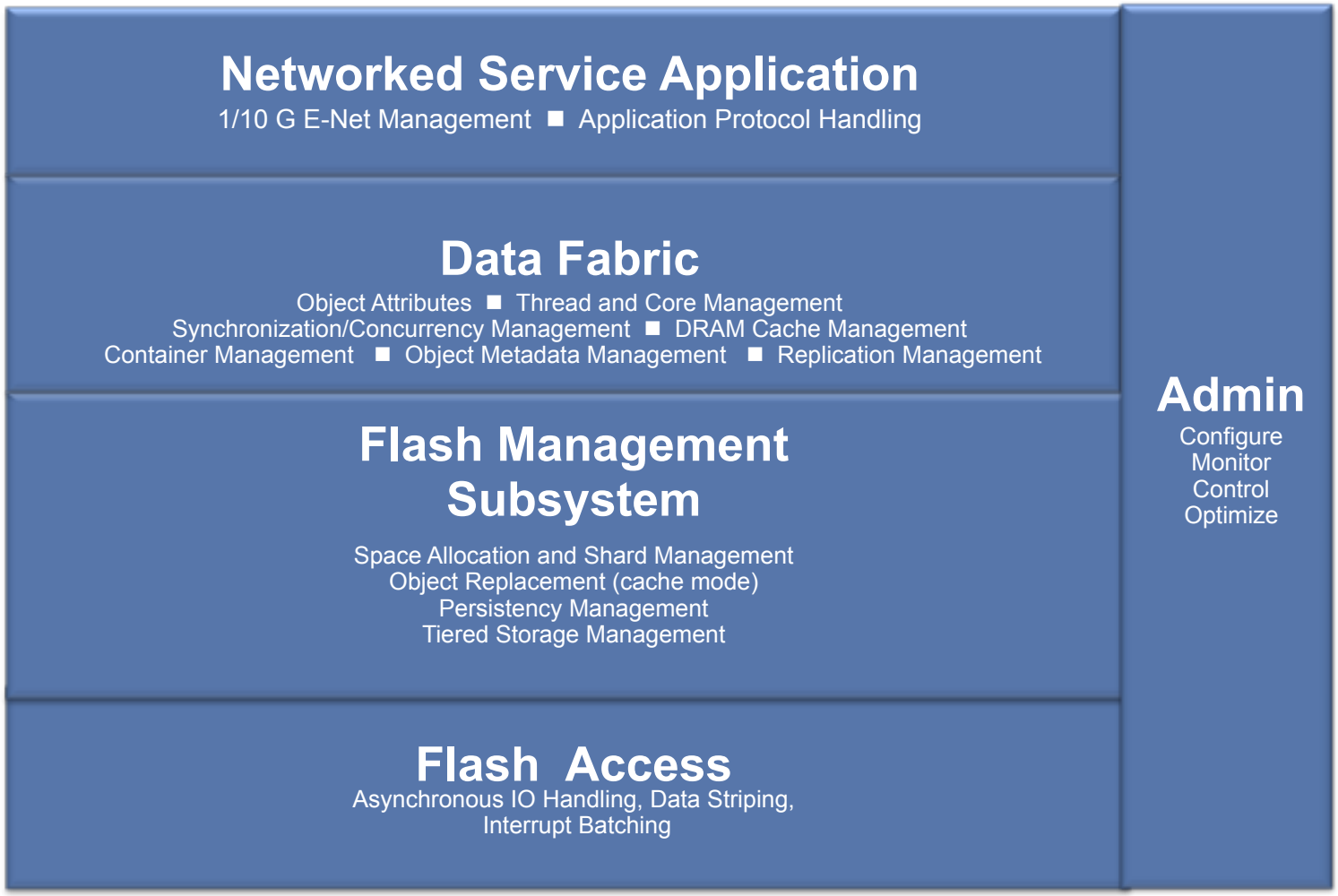
Integrated, optimized, multi-node appliances:

- Effectively leverage multi-core processors, high-speed interconnect, flash memory, middleware software
- Incorporate highly optimized, balanced hardware platform, operating environment, networked middleware data access applications
- Potential: cut power consumption and datacenter floor space by up to 90%
- Compatible with existing web/app tier client applications and monitoring tools
- Provide higher level building blocks that eliminate complex integration projects

Tightly Coupled Hardware Architecture



Tightly Coupled Software Architecture



Tightly Coupled Platform + Operating Environment

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- Optimizes transactions/sec/watt, transactions/sec/core, transactions/sec/$
- Supports application level protocols
- Optimizes multi-core
- Manages highly parallel flash memory devices
- Optimizes memory hierarchy: L1/L2/L3/DRAM/Flash/HD
- Performs efficient multi-node replication with load balancing and transparent failure recovery

Schooner Appliance Overview

Schooner Data Access Appliances

- Purpose-built for Web 2.0 and cloud computing datacenters
- Distributed caching and database appliances
- 8x performance improvements
- 1/8th the power and space requirements
- 60% lower TCO
- 100% compatible with existing client applications and management tools

IBM Partnership

- IBM manufactures, sells, and provides global, 24/7/365, single-point-of-contact service and support for every Schooner appliance

Distributed Caching Tier Appliance Building Block

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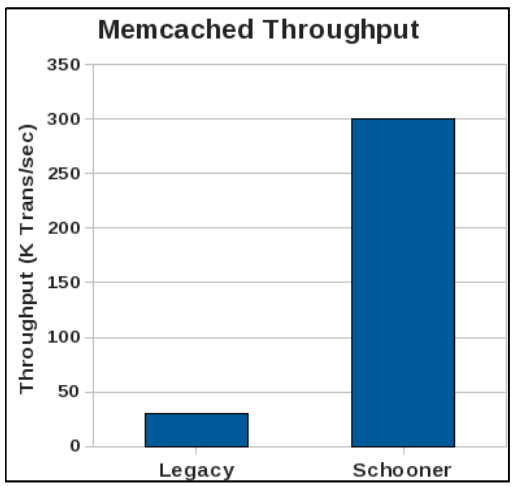
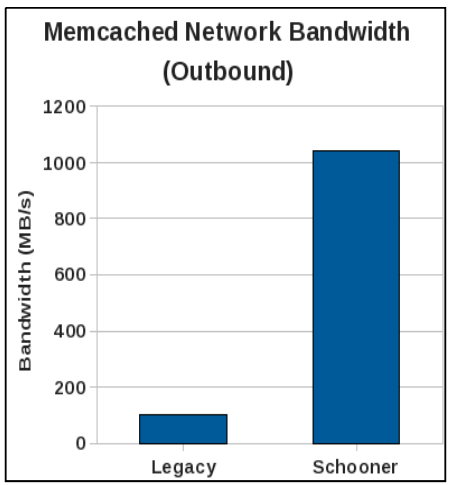
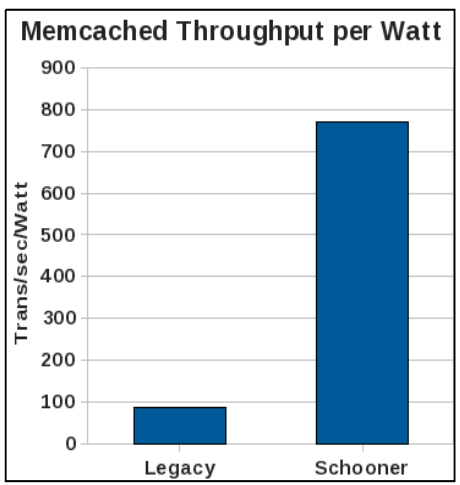
Tightly Integrated Multi-Core + Flash + Interconnect + Distributed Caching

- 10 x throughput and network utilization
- Cache mode or persistent key/value store mode
- 90% reduction in power
- Instantaneous and transparent data persistence, replication, and recovery

Example: Memcached distributed caching tier appliance



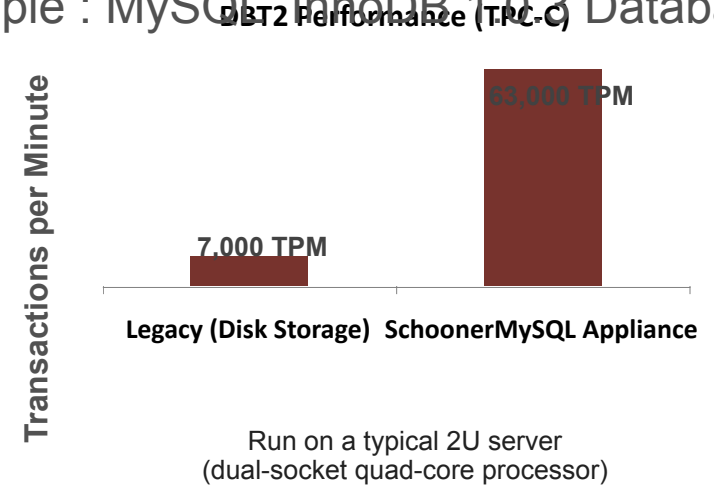


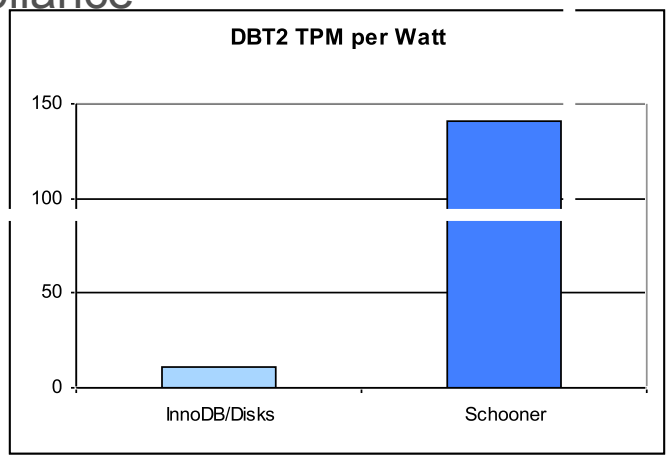


Database Tier Appliance Building Block

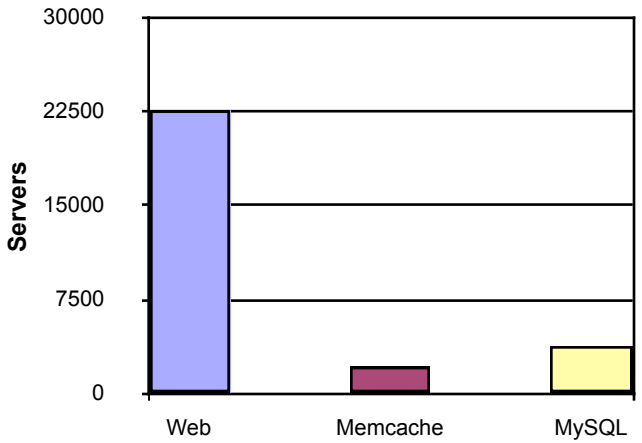
Tightly Integrated Multi-Core + Flash + Interconnect + Database

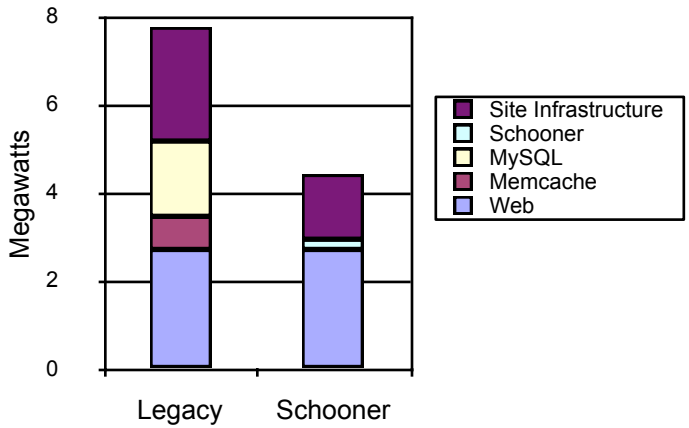
- Tightly integrated, highly optimized
- High read AND write flash IOPS (>200k/sec) + multi-core scaling
  - Read-
    w
    rite intensive workloads (OLTP), as well as OLAP (read mostly workloads)
  - Fast recovery and warm-up after restart or failover
- High Speed Interconnect enables fast failover and replication/recovery
- Example : MySQL InnoDB 1.0.3 Database Appliance





Data Center Impact: Consolidation, Power, TCO





	Legacy Memcache	*Legacy MySQL*	*Schooner Appliance*	*Schooner Savings*
Nodes	**2,150**	**3,800**	**595**	
CapEx	**$13,480,500**	**$50,236,000**	**$26,995,150**	**58%**
OpEx	**$25,206,600**	**$44,551,200**	**$16,257,780**	**77%**
TCO	**$38,687,100**	**$94,787,200**	**$43,252,930**	**68%**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Q&A
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technology


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Thank you.
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Backup Slides
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technology

Flash Drive Comparison

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	Read B/W	Write B/W	Erase Lat.	Read Lat.	Cost per GB
HDD	100 mb/s	150.00 mb/s		5,000.00 us	$0.10
NAND MLC	250 mb/s	70.00 mb/s	3.5 ms	85.00 us	$3.50
NAND SLC	250 mb/s	170.00 mb/s	1.5 ms	75.00 us	$11.00
NOR SLC	58 mb/s	0.13 mb/s	5,000.00 ms	0.27 us	$70.00
DRAM	2,000 mb/s	2,000.00 mb/s		0.08 us	$75.00

Flash Drive Comparison

SCHOONER INFORMATION TECHNOLOGY

	Fusion-io io-drive	X25-E 8x array		
Read latency uS 4KB	75	75	uSEC	
Write Latency uS 4KB	250	85	uSEC	Write latency of hardware
Read CPU uS	50	15	uSEC	
Write CPU uS	50-100	15	uSEC	Increases with garbage collection
Read MBPS 16KB	650	1400	MBPS	
Write MBPS 16KB	150	260	MBPS	Sustained with garbage collection
Read IOPS 4K	116,000	230,000	IOPS	
Write IOPS 4K	20,000	50,000	IOPS	Sustained with garbage collection
Capacity	160	512	GB	
Cost	$7,200	$5,800	USD	
Cost/Gbyte	$56.25	$11.33	USD	

* Write throughput assuming continuous random writes spread across the drive, with 20% reserve capacity configured