

Table 4. Intel IT Data Center Best Practices and Business Value

BEST PRACTICE	BUSINESS VALUE
Compute (Servers)	
Migrate applications from RISC to Intel® architecture ⁱ	<ul style="list-style-type: none"> Enabled significant savings and IT efficiencies Allowed us to realize the benefits of industry-standard OSs and hardware
Adopt cloud computing	<ul style="list-style-type: none"> Virtualized more than 90 percent of Office and Enterprise servers Reduced the time it takes to provision a server from 90 days to on-demand provisioning
Regularly refresh servers using the latest generations of Intel® Xeon® processors	<ul style="list-style-type: none"> Virtualization ratios of up to 60:1 Reduced Design environment energy consumption by 10 percent annually between 2008 and 2013 ~10x increase in performance between 2005 and 2015
Deploy high-performance computing ⁱⁱ	<ul style="list-style-type: none"> 90x increase in capacity, with a 64x increase in stability Saved USD 44.72 million net present value with HPC-1
Enhance server performance through software optimization	<ul style="list-style-type: none"> Increased Design job throughput up to 49 percent Delivered USD 241 million from 2010 to 2015 from various optimizations including NUMA-Booster, fast-swap based on Intel® Solid-State Drives, and high-frequency servers and optimal workload to platform pairing
Storage	
Refresh and modernize storage using the latest generations of Intel Xeon processors	<ul style="list-style-type: none"> Take advantage of new technology to increase storage capacity, quality, velocity, and efficiency at a lower cost More than twice the I/O throughput than older systems Reduced our data center storage hardware footprint by more than 50 percent in 2011-2012 Reduced backup infrastructure cost due to greater sharing of resources Tiered backup solutions to optimize backup costs and improve reliability
Right-size storage solutions using a tiered model ⁱⁱⁱ	<ul style="list-style-type: none"> Provide storage resources based on business needs: performance, reliability, capacity, and cost Better management of storage costs while still enabling easy access to necessary data Transition to scale-out storage to reduce operational complexity in tiering data Automated policy-based data migration between tiers
Continuously monitor and reclaim disk space consumed by aged data	<ul style="list-style-type: none"> More than USD 1 million in capital expenditure avoidance in 2011
Implement thin provisioning and deduplication for storage resources	<ul style="list-style-type: none"> Helps control costs and increase resource utilization without adversely affecting performance Increased storage effective utilization in Design from 46 percent in 2011 to 60 percent in 2015
Network	
Upgrade the data center LAN network architecture to 10 gigabit Ethernet ^{iv}	<ul style="list-style-type: none"> Increased data center network bandwidth by 400 percent over three years, enabling us to respond faster to business needs and accommodate growth Increased the network utilization from 40 percent to 62 percent between 2010 to 2015 Eliminated spanning tree with multi-chassis link aggregation (MLAG) and Layer 3 protocol Reduced network complexity due to fewer network interface cards (NICs) and LAN ports Reduced network cost in our virtualized environment by 18 to 25 percent
Open the data center network to multiple suppliers	<ul style="list-style-type: none"> Generated more than USD 60 million in cost avoidance over five years with new network technology
Facilities	
Increase cooling efficiency	<ul style="list-style-type: none"> Saved close to 16 million kilowatt-hours over 18 months, which is equivalent to reducing our carbon dioxide emissions by 6,800 metric tons
Use a tiered approach to redundancy, availability, and physical hardening	<ul style="list-style-type: none"> Better matching of data center redundancy and availability features to business requirements Reduced wasted power by more than 7 percent by eliminating redundant power distribution systems within a data center
Retrofit and consolidate data centers using a modular design	<ul style="list-style-type: none"> Retrofitted old wafer fabrication plant to high-density, high-efficiency data center modules with industry-leading PUE of 1.06 Utilized free-air cooling and environmentally efficient evaporative cooling for maximum energy efficiency Avoided significant capital expenditures by not equipping the entire facility with generators Quickly respond to changing data center needs with minimal effort and cost

ⁱ For more information see "Migrating Mission-Critical Environments to Intel® Architecture."ⁱⁱ For more information see "High-Performance Computing for Silicon Design."ⁱⁱⁱ For more information see "Implementing Cloud Storage Metrics to Improve IT Efficiency and Capacity Management."^{iv} For more information see "Upgrading Data Center Network Architecture to 10 Gigabit Ethernet."