



IT@Intel

Efficiency through IT Hardware, Software & Process

Breakthrough technologies, solutions, and processes have optimally served the acceleration of Intel's business

intel[®]

Legal Notices

No product or component can be absolutely secure.

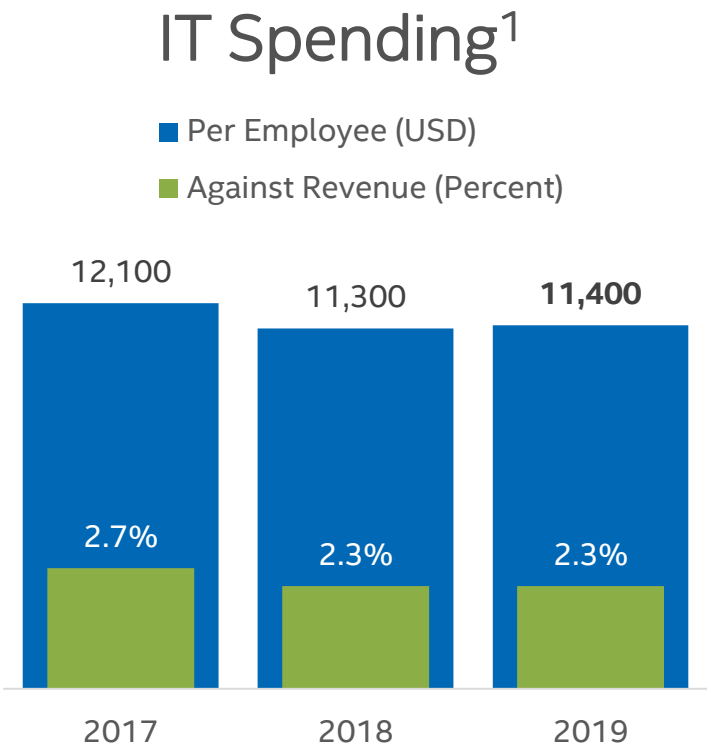
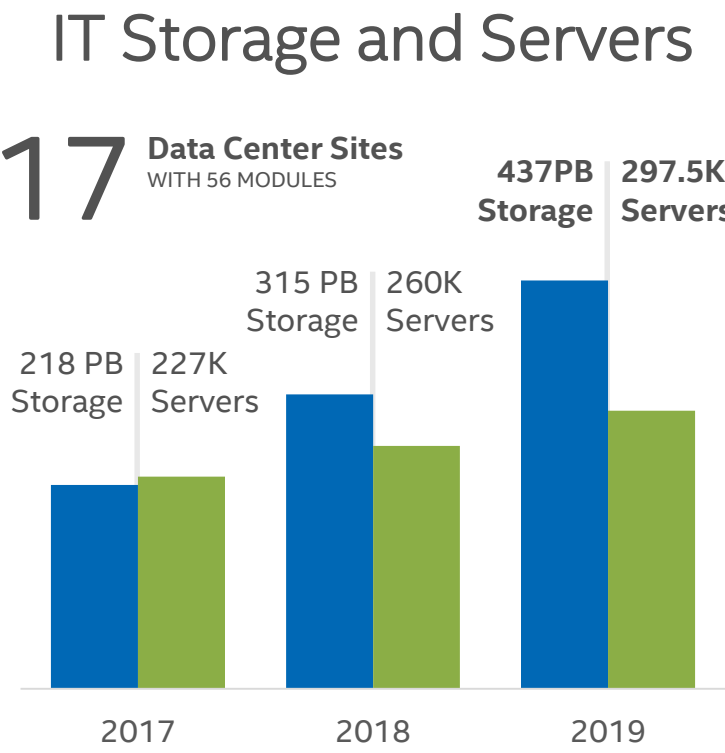
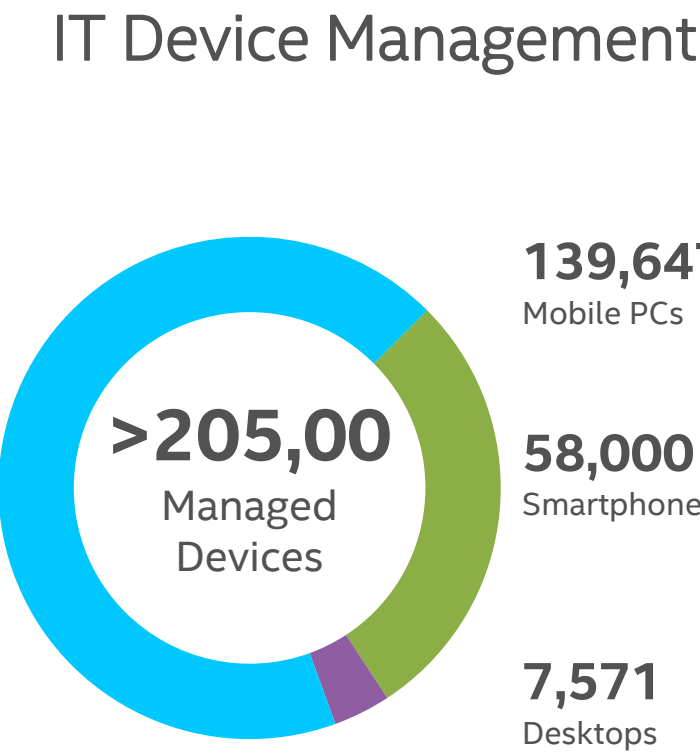
Your costs and results may vary.

Intel technologies may require enabled hardware, software or service activation.

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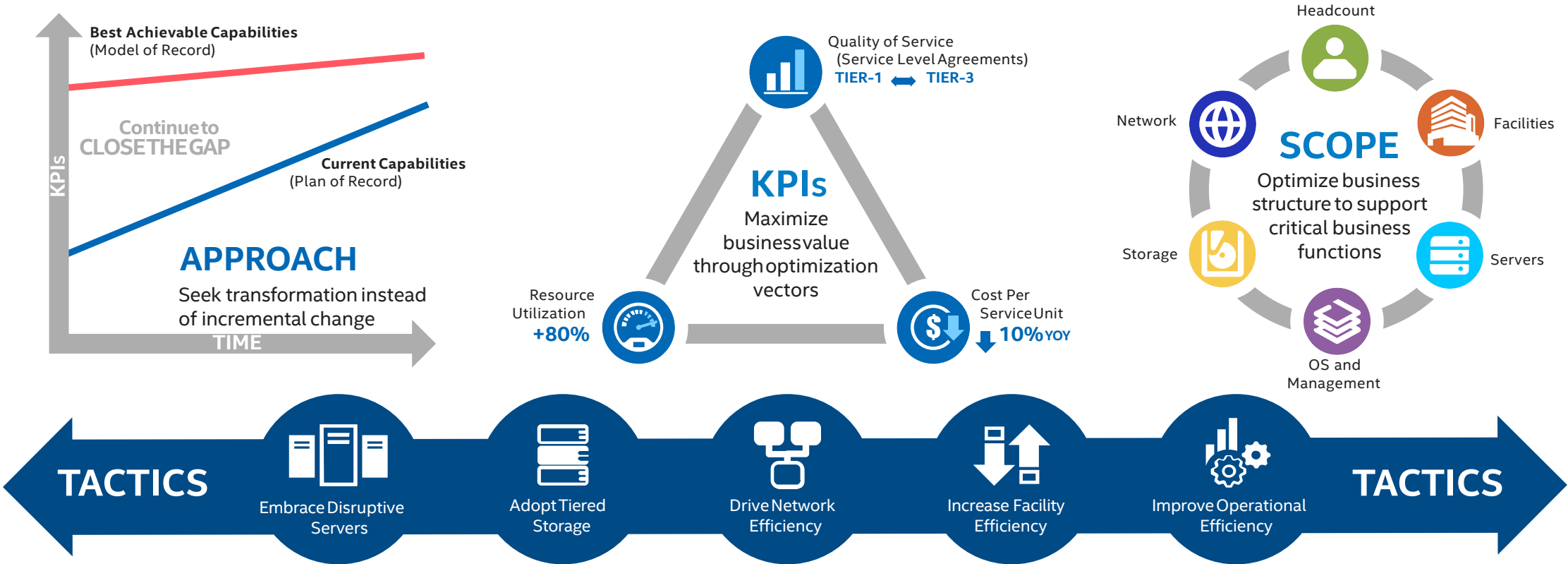
Intel IT Environment



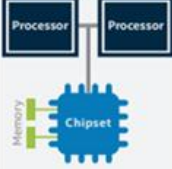
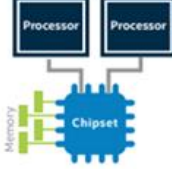
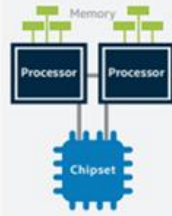
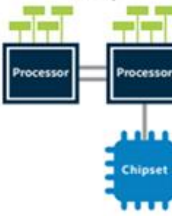
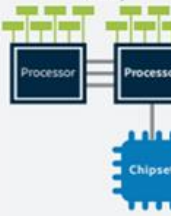
¹Financials restated to include wholly owned subsidiaries that have since been integrated and exclude divested entities. Employee count represents an average of beginning and end of year.

Intel IT Data Center Transformation Strategy

We operate our data center service like a factory by applying breakthrough technologies, solutions, and processes to achieve industry leadership.



CPU Comparison

	2004-2005	2006-2008	2009-2011	2012-2016				2017-2019
								
Introduction	2004-2005	2006-2008	2009-2011	2012	2013	2014	2016	2017-2019
Intel® Chipset	E7520	5400	5520	C600		C610		C620
Process Technology	90nm	65nm and 45nm	45nm and 32nm	32nm	22nm		14nm	
Cores per Socket	1	2 or 4	4 or 6	8	10	14	22	28
Cache	1 MB or 2 MB ¹	4 MB or 6 MB shared between 2 cores	8 MB or 12 MB shared	20 MB shared	30 MB shared	45 MB shared	55 MB shared	38.5 MB shared
Interconnect Speed	6.4 GB/s	21-25 GB/s	25.6 GB/s per Intel® QuickPath Interconnect	32 GB/s per Intel® QuickPath Interconnect		38.4 GB/s per Intel® QuickPath Interconnect		41.6 GB/s per Intel® UltraPath Interconnect
DIMMs	Up to 8	Up to 16	Up to 18	Up to 24				
Memory Type	DDR2-400 MHz	FB-DIMM/DDR2-667 MHz or FB-DIMM/DDR2-800 MHz	DDR3-800/1066/1333 MHz	DDR3-1333/1600 MHz	DDR3-1333/1600/1866 MHz	DDR4-1600/1866/2133 MHz	DDR4-2400 MHz	DDR4-2666/2933MHz
Memory Bandwidth	Up to 6.4 GB/s	21-25 GB/s	Up to 32 GB/s	Up to 51.2 GB/s	Up to 59.7 GB/s	Up to 68 GB/s	Up to 76.8 GB/s	Up to 128/140 GB/s
Maximum Memory	16 GB	64 GB or 128 GB ²	144 GB or 288 GB ³	Up to 768 GB ⁴	Up to 1536 GB ⁵			Up to 3072 GB ⁶

¹ Data provided only for 1 MB cache. ² 128 GB support with Intel® 5400 Chipset introduced in 2007. ³ 144 GB assumes 18 memory slots populated with 8-GB DIMMs; 288 GB assumes 18 memory slots populated with 16-GB DIMMs, and validated only with Intel® Xeon® processor 5600 series. ⁴ 768 GB assumes 24 memory slots populated with 32-GB DIMMs. ⁵ 1536 GB assumes 24 memory slots populated with 64-GB DIMMs. ⁶ 3072 GB assumes 24 memory slots populated with 128-GB DIMMs

Server Refresh Cadence Evaluation

- Refresh ratios vary based on server usage and performance.

- Key cost factors:

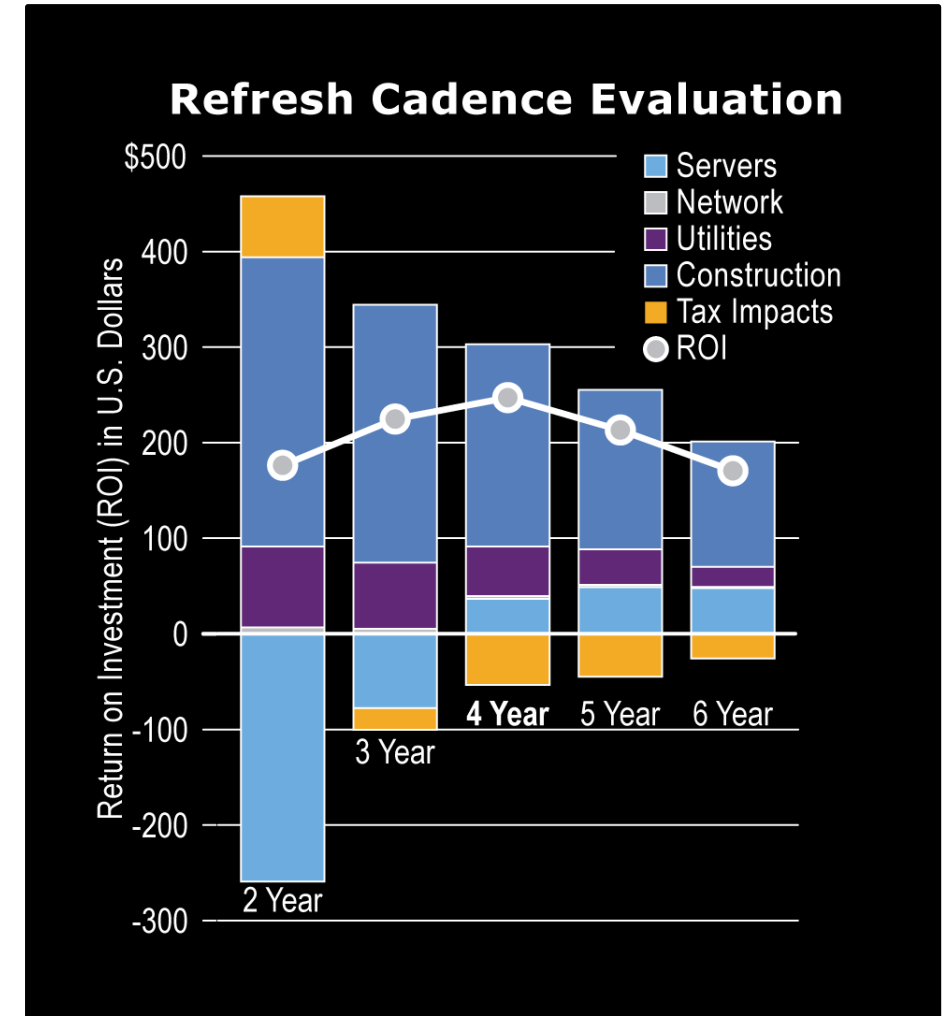
- Server costs and warranties
- Data center construction
- Power efficiencies
- Reduced network switch costs
- Tax impacts

Additional considerations:

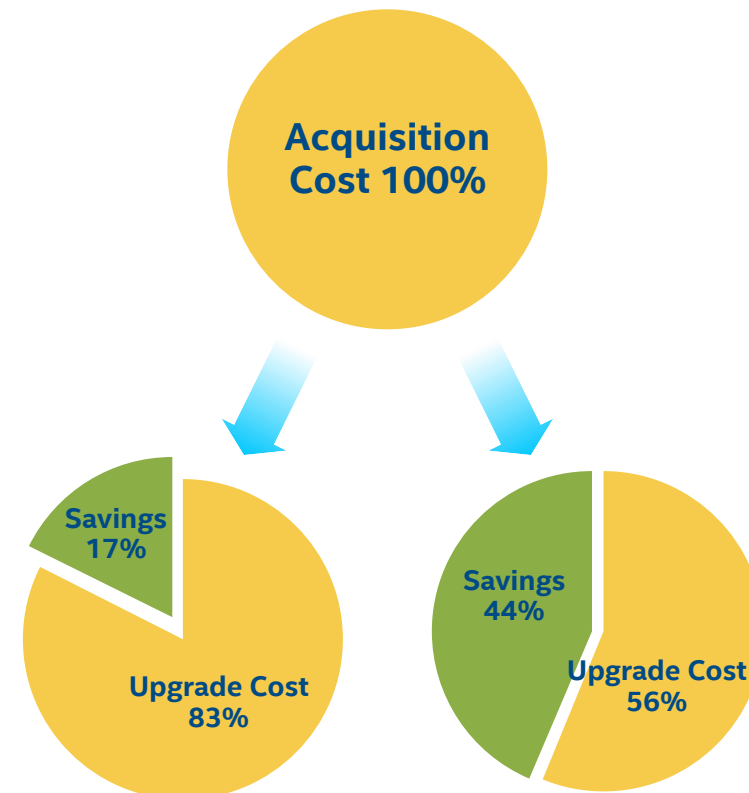
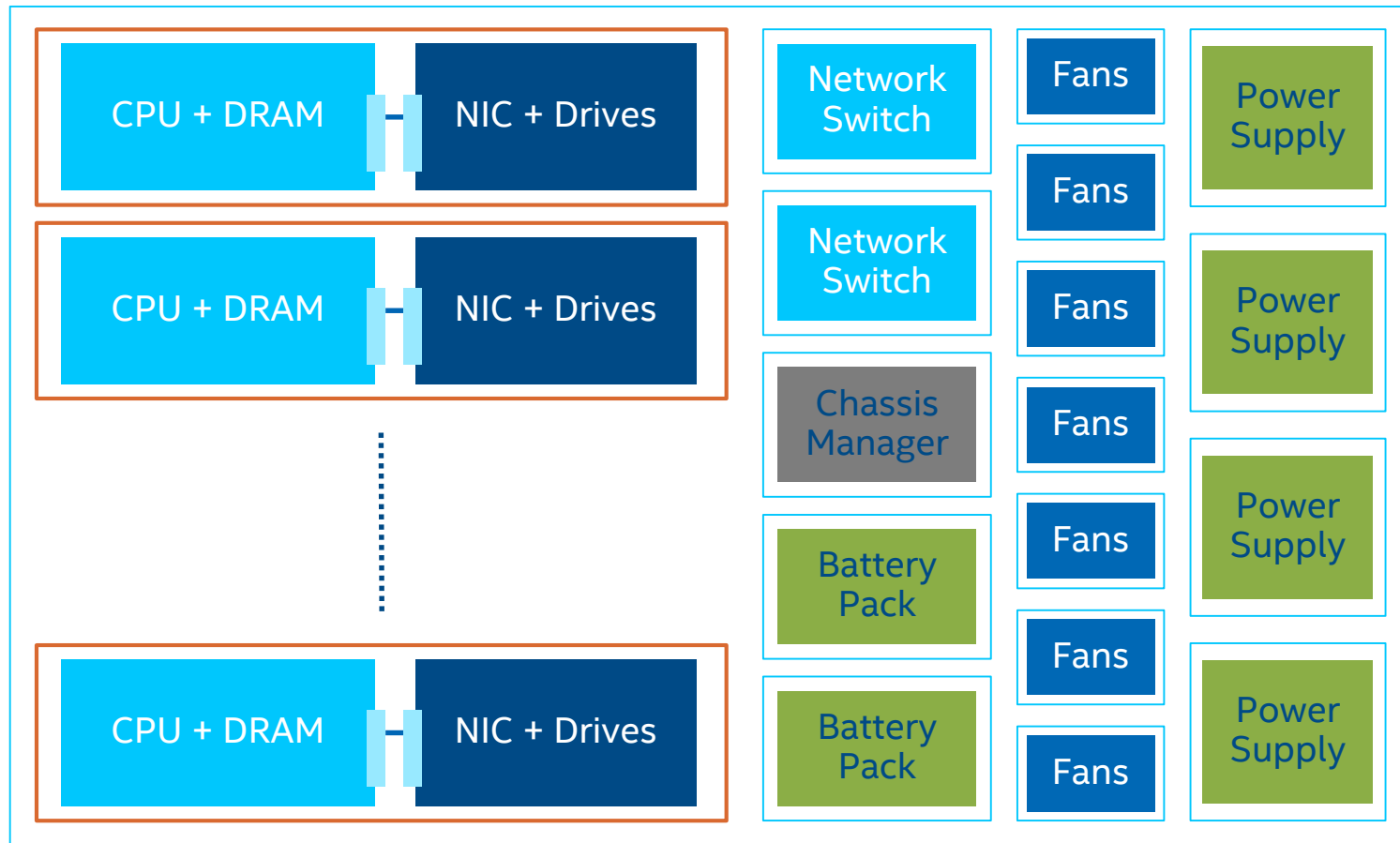
- Energy/tax rebate programs
- Green IT
- Productivity impacts

Internal cost evaluation is the primary driver in determining optimal refresh cadence:

4-Year Cadence at enterprise level



Disaggregated Server Innovation & Value

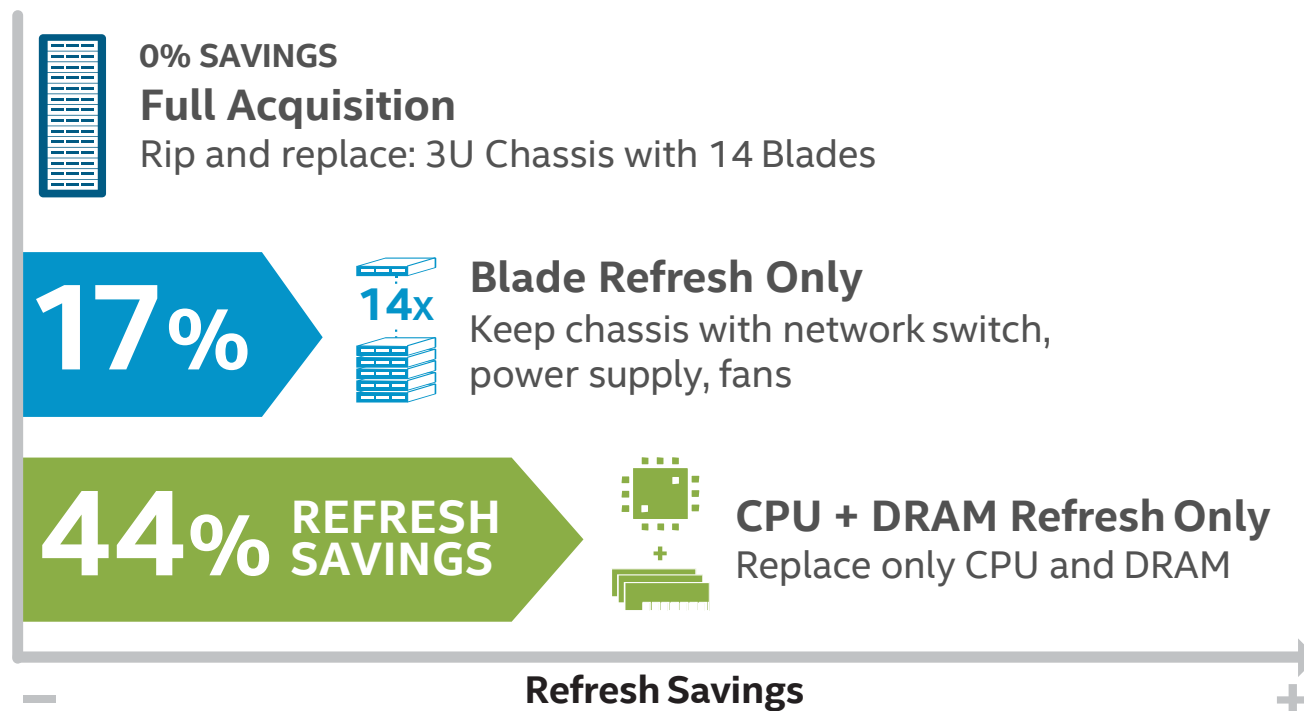


77% percent savings in technician time
82% savings in shipping/materials

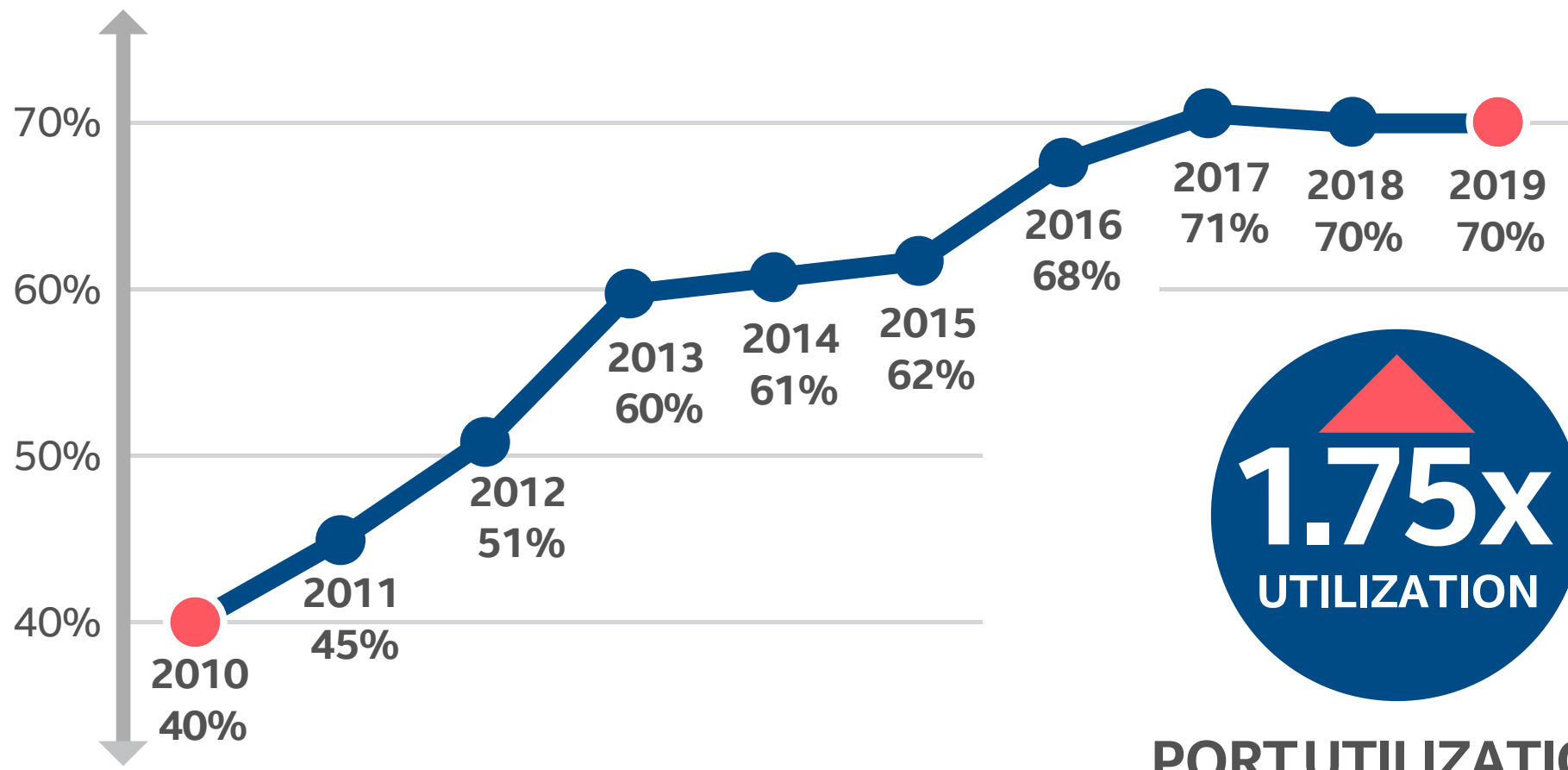
Refresh Savings Example

3U Chassis with 14 Blades

Our disaggregated server architecture has the potential to dramatically change how data centers around the world perform server refreshes.



Effective 10 GbE Port Utilization



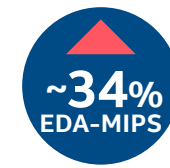
1.75x
UTILIZATION

PORT UTILIZATION
2010-2019

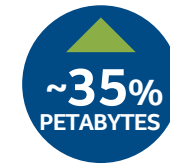
Design: Compute and Storage Demand

Despite continuing growth in compute and storage demand, our Design data centers are using powerful Intel® technology to meet demand.

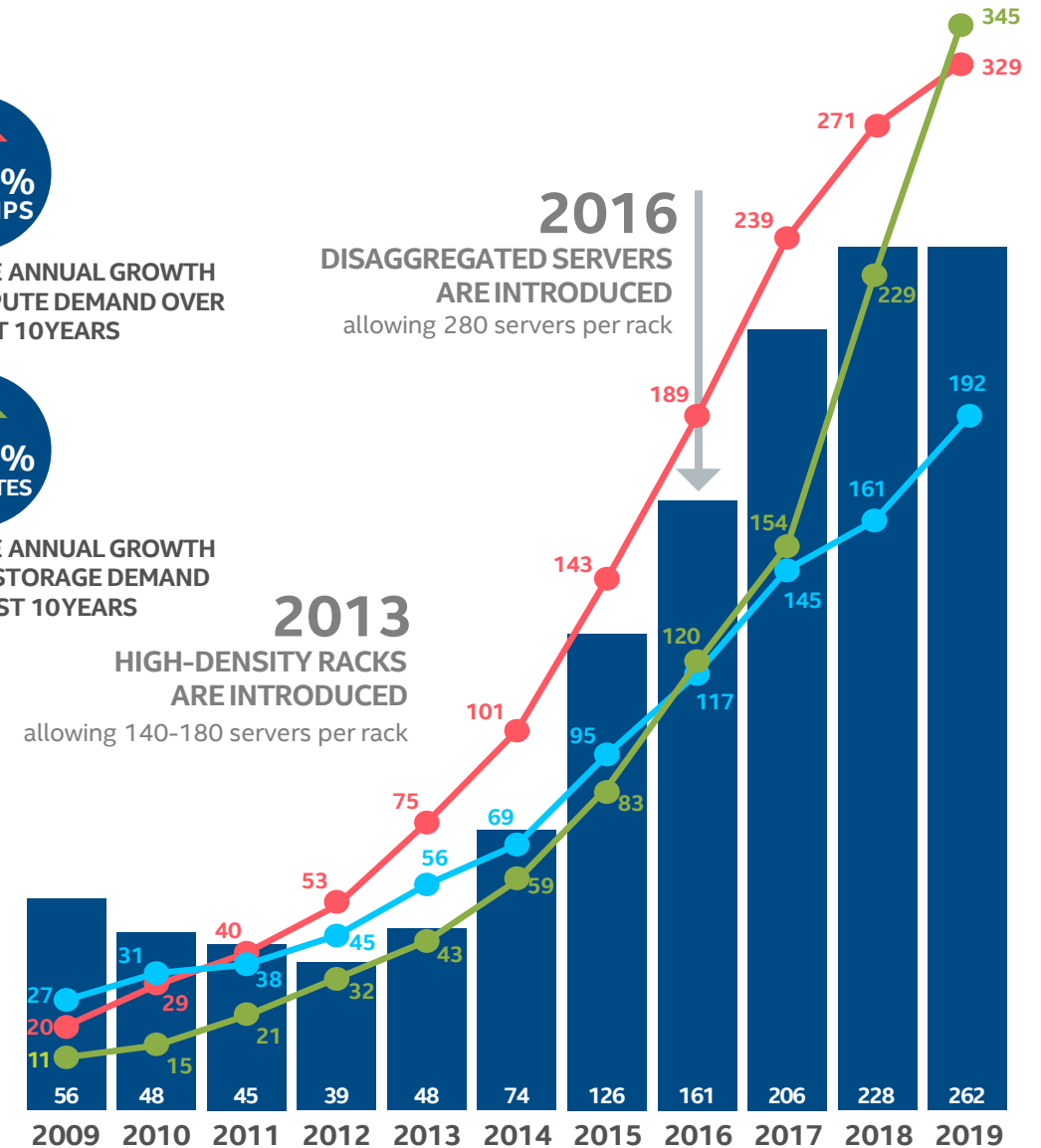
■ Design Servers (1k) ■ EDA-MIPS (10K) ■ Cores (10K) ■ Raw Storage (PB)



AVERAGE ANNUAL GROWTH
OF COMPUTE DEMAND OVER
THE LAST 10 YEARS



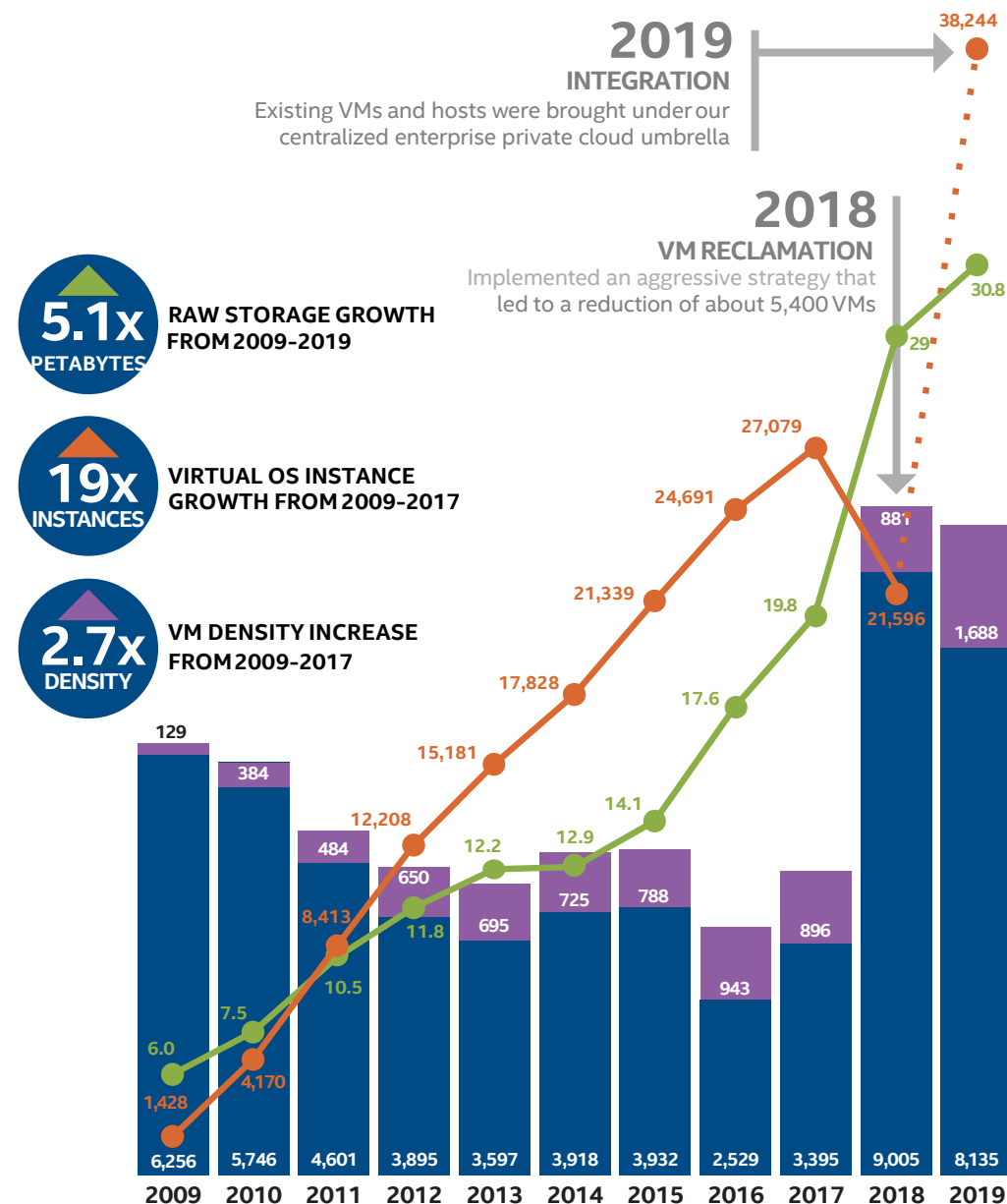
AVERAGE ANNUAL GROWTH
OF RAW STORAGE DEMAND
OVER LAST 10 YEARS



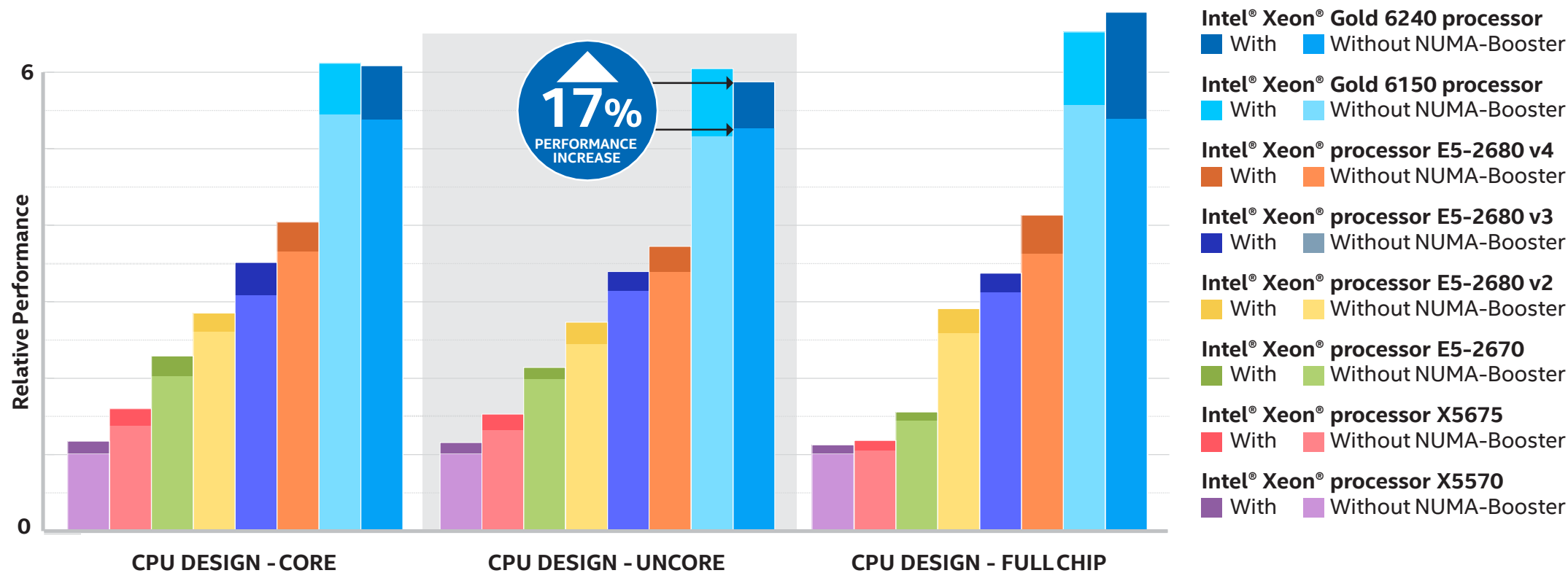
Office and Enterprise: Compute and Storage Demand

A high rate of virtualization combined with Intel® architecture has enabled us to meet growing Office and Enterprise compute and storage demand while significantly decreasing the number of required virtualization host servers.

■ Physical Servers ■ VM Hosts ● Virtual OS Instances ● Raw Storage (PB)



Design: Register Transfer Logic Performance with NUMA-Booster



System with 2x Intel® Xeon® processor X5570, 72 GB DDR3-1333 RAM, 1x 900 GB 10K RPM SAS hard drive, with Linux 2.6 OS, running Intel silicon design simulation workload.

System with 2x Intel® Xeon® processor X5675, 96 GB DDR3-1333 RAM, 1x 900 GB 10K RPM SAS hard drive, with Linux 2.6 OS, running Intel silicon design simulation workload.

System with 2x Intel® Xeon® processor E5-2670, 128 GB DDR3-1333 RAM, 1x 900 GB 10K RPM SAS hard drive, with Linux 2.6 OS, running Intel silicon design simulation workload.

System with 2x Intel® Xeon® processor E5-2680 v2, 256 GB DDR3-1600 RAM, 1x 900 GB 10K RPM SAS hard drive, with Linux 2.6 OS, running Intel silicon design simulation workload.

System with 2x Intel® Xeon® processor E5-2680 v3, 256 GB DDR4-2133 RAM, 1x 900 GB 10K RPM SAS hard drive, with Linux 3.0 OS, running Intel silicon design simulation workload.

System with 2x Intel® Xeon® processor E5-2680 v4, 256 GB DDR4-2400 RAM, 1x 1.2 TB 10K RPM SAS hard drive, with Linux 3.0 OS, running Intel silicon design simulation workload.

System with 2x Intel® Xeon® Gold 6150 processor, 768 GB DDR4-2666 RAM, 2x 1.2TB 10K RPM SAS hard drive, with Linux 3.0 OS, running Intel silicon design simulation workload.

System with 2x Intel® Xeon® Gold 6240 processor, 768 GB DDR4-2933 RAM, 2x 1.2TB 10K RPM SAS hard drive, with Linux 3.0 OS, running Intel silicon design simulation workload.

Intel® DCM

REAL-TIME
POWER, THERMAL, HEALTH
Monitoring & analytics



IMPROVES UPTIME
By health monitoring & prediction



CROSS-PLATFORM
SUPPORT
Easy to integrate or install



AGGREGATED DATA
To physical groups
(e.g. room/row/rack) & logical groups



BETTER DATA CENTER
Capacity planning



INCREASED EFFICIENCY
By identifying under
utilized devices



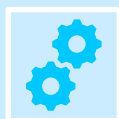
Summary



Data Center Transformation Strategy



Hardware Refresh On Time



Effective Resource Utilization



Adopting Software Capabilities

Learn More

By applying breakthrough technologies, solutions, and processes, we have optimally served the acceleration of Intel's business.

Read our paper “IT@Intel: Data Center Strategy Leading Intel's Business Transformation” for additional details.



WHITE PAPER
Data Center
July 2020

IT@Intel: Data Center Strategy Leading Intel's Business Transformation

By applying breakthrough technologies, solutions, and processes, we have optimally served the acceleration of Intel's business

Executive Summary

Intel IT runs Intel data center services like a factory, affecting change in a disciplined manner and applying breakthrough technologies, solutions, and processes. This enables us to optimally meet Intel's business requirements while providing our internal customers with effective data center infrastructure capabilities and innovative business services.

Building on previous investments and techniques, our data center strategy has generated savings exceeding USD 3.8 billion from 2010 to 2019.

Over the next three years, we plan to extend the data center strategy to continue our data center infrastructure transformation. We will accomplish this by using disruptive server, storage, network, infrastructure software, and data center facility technologies. These can lead to unprecedented quality-of-service levels and reduction in total cost of ownership (TCO) for business applications. And they will enable us to continue to improve IT operational efficiency and be environmentally responsible.

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Table of Contents

Background	2
Defining a Model of Record	4
Results: Building on the Past, Building for the Future	8
Summary of Best Practices	17
Plans for 2020 and Beyond	17
Conclusion	20

USD 3.8 BILLION IN SAVINGS

THROUGH

- 44% SAVINGS**
with a Disaggregated Server Design compared to a full-acquisition refresh
- 400% INCREASE**
in Data Transfer Rates between sites through international WAN links
- 1-DAY DEPLOYMENT**
using our Process Transformation for new physical server deployment
- 252x INCREASE**
in our HPC Environment with 107x improvement in Quality

IT@Intel:

Sharing Intel IT Best Practices with the World



WHITE PAPER
Data Center
July 2020

IT@Intel: Data Center Strategy Leading Intel's Business Transformation

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USD 3.8 BILLION IN SAVINGS

THROUGH

- 44% SAVINGS in TCO per server rack through hardware innovation
- 400% INCREASE in server rack density through hardware innovation
- 1-DAY DEPLOYMENT for new server rack deployment
- 25% INCREASE in server rack density through hardware innovation

OUR DIGITAL TRANSFORMATION JOURNEY

"A corporation is a living organism. It has to continue to shed its skin. Methods have to change. Focus has to change. Values have to change." The same held of these changes in transformation."

Digital transformation is not the speed industry catchphrase. It is a movement to take companies online, offline, and on. The movement we are engaged in is technology advancement on the cloud, as well as that of together with the other business partners and their digital capabilities.

ADACCELERATE WATERGROW THROUGH BEST-IN-CLASS IT SOLUTIONS & SERVICES

- Accelerate Intel's Business
- Transform Intel's Business
- Improve Intel's Business
- Secure Intel's Business
- Enable Intel's Business
- Protect Intel's Business

INNOVATION BEGINS WITH IT'S TRANSFORMATION

To sustain Intel's digital transformation must be built on a sturdy foundation of connected data and advanced analytics. Both allow us to amplify efficiency and effectiveness with our assets and boost business processes. But more than that, they are the key to our success as an IT organization as we continue to transform our business. This is why we are committed to a journey of digital transformation that will enable us to continue to lead the world in innovation.

Shaping Our Culture to Drive Transformation

Building on the success of our previous transformation efforts, we are now focused on driving a cultural transformation that will enable us to continue to lead the world in innovation. This is why we are committed to a journey of digital transformation that will enable us to continue to lead the world in innovation.

OUR DATA AND AI EFFORTS PAVE THE WAY FOR GREATER INSIGHTS

Guiding Intel to Adopt a Data-First Mindset

For enterprise users to truly make digital transformation work, they need a data-first mindset. This means that data is the foundation of all business decisions. Intel is committed to a data-first mindset, and we are working to ensure that our data is the foundation of all business decisions.

AMY WARNER
VP, Information Technology Group
and Senior Business Solutions

Intel IT runs Intel data center services like a factory, affecting change in a disciplined manner and applying breakthrough technologies, solutions, and processes. This enables us to optimally meet Intel's business requirements while providing our internal customers with effective data center infrastructure capabilities and innovative business services.

Sharing Intel IT Best Practices with the World

IT@Intel: Insight for Business Growth

Intel IT plays a central role in increasing the value of Intel's business. We work at the boundaries of innovation every day, developing data-driven solutions to improve the operations and processes of a global technology leader. Our deep knowledge and experience as IT professionals are shared with you here.

IT Leadership Data & AI Platforms, Cloud & Security Processes & Applications Modern Workplace

SOLUTION BRIEF
Security
August 2019

IT@INTEL Security Architecture Enables Intel's Digital Transformation

Intel IT's Enterprise Security architecture enables business units to focus on their goals while maintaining security standards.

**IT@INTEL
A Holistic Cloud Approach for
Big Savings**

With a cloud-native app development plan, cost-reduction strategy, and centralized management, Intel IT has reaped big savings on cloud computing.

WHITE PAPER
Data Center
March 2020

IT@INTEL Building a Multi-Cloud-Ready Enterprise Network

Intel IT has adopted a new network paradigm that supports evolving business needs while continuing to meet Intel's stringent information security and privacy standards.

WHITE PAPER
Data Center
November 2019

IT@INTEL Transforming Intel's Security Posture with Innovations in Data Intelligence

Intel's new Cyber Intelligence Platform provides a context-rich environment that provides value across our entire Information Security organization. It has transformed how information security works with a data advantage.

Multi-Cloud Strategy

THE BATTLE AGAINST TECHNICAL DEBT ON THE JOURNEY TO IT'S TRANSFORMATION

Reducing technical debt demands a shift in IT processes and skill sets, introducing challenges and opportunities. Intel offers a solution to this universal challenge with a unique approach that will drive major business value.

Learn more about Intel IT's initiatives at: www.intel.com/IT →

