

# Achieving Intel Transformation through IT Innovation

2014–2015 Intel IT Business Review – Annual Edition





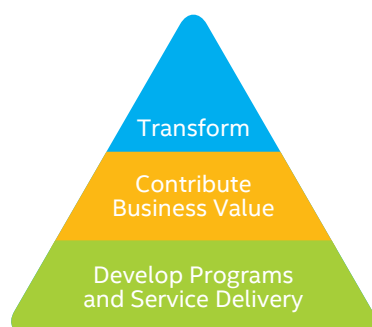
Kim Stevenson  
Intel Chief Information Officer

# The Transformative Power of Innovation

## Contents

|   |    |
|---|----|
| Our IT Environment.....   | 3  |
| Social<br>Transforming the Workplace—and<br>the Business—with Collaboration ..... | 4  |
| Mobile<br>Harnessing the Value of<br>Touch and Mobile Computing .....             | 7  |
| Analytics<br>Delivering Insights Worth Millions<br>through Analytics .....        | 10 |
| Cloud<br>Increasing Business Velocity<br>with the Cloud .....                     | 13 |
| Internet of Things<br>Transforming the Enterprise with IoT ..                     | 15 |
| Security<br>Making It Safe For Intel to Go Fast ...                               | 18 |
| Looking to the Future .....   | 20 |

## IT Leadership Pyramid



Welcome to the Intel IT Business Review annual edition, where we share our highlights and progress in driving Intel to improve in productivity, efficiency, time to market, and profitability. More than ever, I am convinced that this is an exciting time as we enter a new era for Enterprise IT. Market leadership is increasingly being driven by technology in all industries, and a new economic narrative is being written that challenges business models that have been in place for decades. Intel is no different, and in this edition we share the highlights of how Intel IT is delivering valuable innovations through social, mobile, analytics, cloud, and the Internet of Things.

In 2014, Intel delivered our highest revenue year ever. This was possible because we are rapidly changing the business by expanding the product portfolio, evolving user experiences, and diversifying the customer base. The expansion of Intel's product portfolio means IT must deliver an increasingly complex lineup of new products and services. We have closely aligned IT with Intel's business groups forming strategic partnerships and shared objectives, which has enabled radically improved business performance.

As I discussed in last year's Business Review, we are meeting our goals by climbing the **IT leadership pyramid**. For day-to-day services, we are steadfastly focused on operational excellence and relentlessly pursuing continuous improvement to keep the business running efficiently while protecting Intel's assets. We also continue to create business value by helping to bring products to market faster (sometimes as much as three months faster) and by boosting employee productivity and mobility through devices and collaboration tools that are fit for purpose.

At the top of the pyramid, we are transforming the way Intel employees work and the way IT delivers services. Through our use of data analytics and collaboration tools, we have optimized business workflows and unlocked new insights to solve the business's largest challenges. Our strategic alignment to business imperatives has generated millions of dollars in new revenue, while the Internet of Things is creating a new level of performance optimization.

I hope you use this report as a launch pad for an animated dialogue with your business leaders about how technology and innovation can catapult your business to record levels. As IT professionals, we learn from one another—so please share your insights, challenges, and methodologies with me on Twitter ([@kimsstevenson](https://twitter.com/kimsstevenson)) and on [intel.com/IT](http://intel.com/IT). Together, we can transform more than just IT and our respective businesses—we can bring innovation and insight to every person on Earth.

# Our IT Environment

Intel IT successfully supports >106,000 employees at 170 Intel sites in 66 countries with our 50 IT sites and 6,065 IT employees

## IT Spending per Employee in USD

Goal 12,000-15,000



## Percent of IT Spending against Revenue

Goal <2.60%



## Business Intelligence

We delivered over USD 351 million in revenue through the use of advanced analytics tools

### USD 76.2 M

Revenue increase from advanced analytics on sales leads

### USD 264 M

Revenue increase from advanced analytics on supply, demand, and pricing



## Social Collaboration

Of 102,000 employees surveyed, 77,520 participate on our social collaboration platform

76%

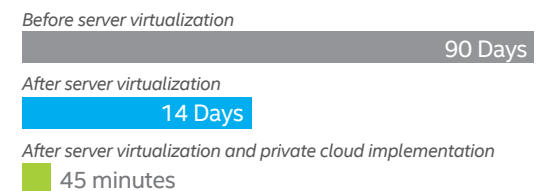
participate in social collaboration



## Cloud Services

With the construction of our private cloud we can provision new web apps in <1 day

### Time to Provision Infrastructure Services

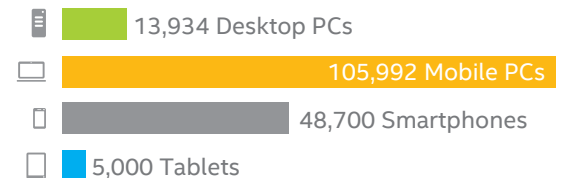


## Devices

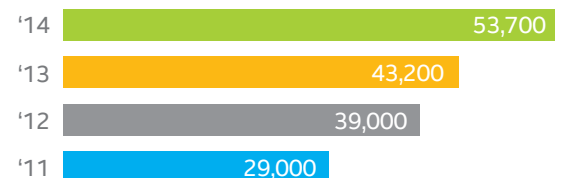
45,000 touch-enabled Ultrabook™ devices are provided by IT

### Devices IT Supports

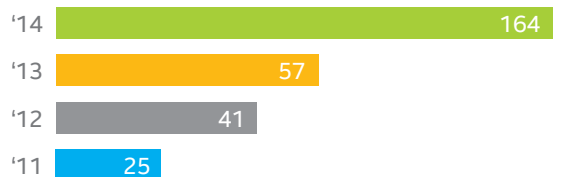
Includes our bring-your-own-device program



### Number of Handheld Devices



### Number of Mobile Apps Developed

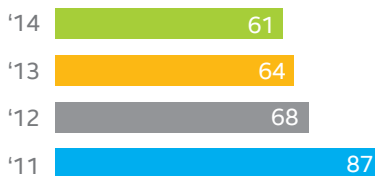


## Data Centers

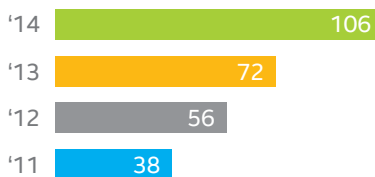
More than 80% of our data centers have been virtualized

### Number of Data Centers

Does not include manufacturing data centers



### Petabytes of Storage Capacity

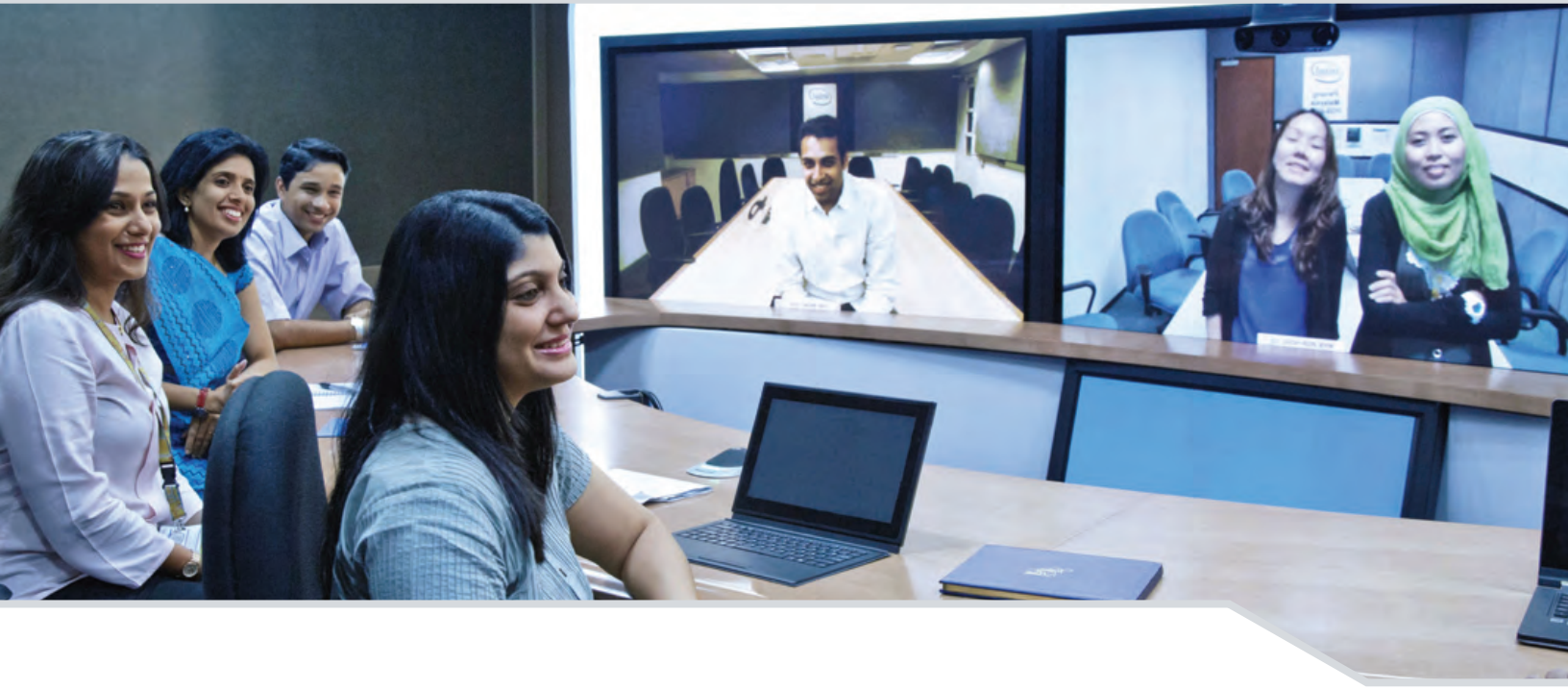


## Security

Time for Data Analysis Throughput to Detect Threats







## SOCIAL

## Transforming the Workplace—and the Business—with Collaboration

### Unleashing the Collective Intelligence of 106,000 Employees

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Intel IT supports over 106,000 employees<sup>1</sup> at 170 sites in 66 countries. Our ability to be an industry leader is a direct result of our ability to leverage our collective talent and expertise. However, dispersion of talent across the globe and organizational boundaries makes it difficult for employees to find and access expertise in real time. Portable storage media and informal networks are now insufficient to serve the ever-increasing pace of business. Social computing and advanced collaboration democratizes the sharing of ideas and provides the potential for our talent and expertise to be accessible to all Intel employees. These capabilities increase the velocity of Intel's business by transforming the workplace. They address specific, shared goals of our business leaders to reduce organizational boundaries, increase speed to information, help build stronger teams, and improve employee productivity. In particular, collaboration technology is fostering a sharing culture that drives sales through greater connectivity.

<sup>1</sup> The number does not include temporary or contingent workers that IT supports.



## Boosting Productivity and Sales

Many teams across Intel use documents that require regular editing by multiple team members. Traditionally, doing this meant emailing documents and slide presentations from one person to the next, leading to inefficiency and problems with version control. Our internal collaboration platform improves productivity by enabling multiple individuals to view, edit, and comment simultaneously. This capability results in significant time savings—by as much as 19 hours per month across one team, for example. The time saved can be used on higher priority activities.

Collaboration tools also help accelerate Intel's sales objectives, shortening the time to design win in one geographical region by up to 50 percent in just 90 days and helping sales teams identify multiple new opportunities representing more than USD 1.5 million in potential design wins. These achievements are a direct result of how our social collaboration platform enables sales teams to better understand customer needs and advance opportunities more quickly by accessing a repository for best-known methods, broadly sharing market knowledge, and increasing worldwide coordination of campaigns.

### What Is Intel's Social Collaboration Platform?

Our social collaboration platform is the next evolution of employee interaction that provides flexible communication channels, such as blogs, discussions, questions, and ideas, fit for two-way or community engagement, project management, document creation, and many other needs.

## Collaborating More Effectively

Most of the meetings at Intel use web conferencing and videoconferencing tools, phone bridges, and instant messaging, involving participants worldwide. In 2014, we worked with multiple groups to optimize their use of online meeting capabilities and effective meeting practices through targeted training, communications, and group leader sponsorship. As a result of these efforts, employees' time is used more effectively: 78 percent of participants reported that online meetings started within 2 minutes of the originally scheduled starting time; an additional 18.6 percent reported that their online meetings started between 2 and 3 minutes of their starting time. We intend to extend this approach more broadly in 2015 to leverage these time savings across Intel's entire workforce.

To increase the benefits of collaboration, Intel IT is integrating its collaboration tools with Intel's business processes. This integration provides an end-to-end experience for employees that is a natural part of their work environment, enabling teams to share ideas anytime, anywhere, and on any suitable device. Our social collaboration platform embodies



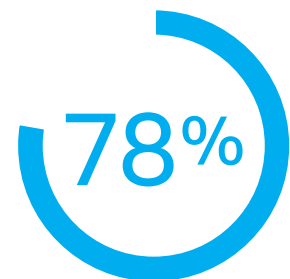
19

**HOURS PER MONTH**  
Saved in one group by using  
collaboration editing tools



↓ 50%

Decrease in time to a design  
win by using collaboration  
tools to identify new customer  
opportunities



Participants reported that  
online meetings started within  
2 minutes of their start time



“The ability to reach so many people and answer so many interesting and pertinent questions in a single hour is amazing.”

**Rosalind Hudnell**

Intel Vice President of Human Resources and Director of Communications and Diversity

the business-friendly principles of crowdsourcing and knowledge sharing. To encourage use of the platform, we display not only the comments on employees' posts, but also the number of people who have read, liked, bookmarked, and shared each post. We also use gamification features such as points and badges to increase participation.

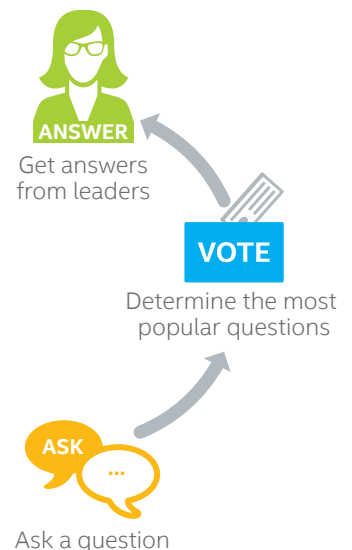
Our Intel® architecture-based infrastructure, which includes a continuum of computing devices, back-end enterprise servers, wireless networks, and telephony, underpins Intel's global collaborative platform and is critical in supporting new collaboration technologies as they emerge. By improving the user experience and engaging employees, our social collaboration efforts are helping to transform Intel's business while enhancing collaborative culture throughout Intel.

## Facilitating Two-Way Collaboration

We have found that engaging employees in organizational goals and strategies can best be accomplished through dialogue. Intel IT's ask-vote-answer forum, called “Take It to the Top,” merges social collaboration with crowdsourcing and has enabled a new kind of online communication between Intel's global workforce and its senior executives. Intel employees post questions; the featured person answers the most popular questions, as determined by employee votes. This process happens within the integrated social collaboration tool, so employees can participate without disrupting their work.





We held our first “Take It to the Top” event in June 2014 with Intel CEO Brian Krzanich and Intel President Renée James. About 14,000 employees participated, submitting 700 questions and comments and casting 13,000 votes. Sharing leaders' responses to issues that interest employees through social collaboration is encouraging two-way collaboration that can help align business goals with everyone at Intel. After the event, Krzanich and his team said they enjoyed the process, and they found the interface easy to use. Feedback from the rest of the employees was also positive.

We plan to extend the ask-vote-answer forum to a broader audience, making it a self-service tool and including additional capabilities such as web chat. Leaders and managers will be able to use the forum to jump-start initiatives with their teams, and employees can use it to get ideas for new projects or to share their expertise.



### Take Action

Learn more about what Intel IT is doing with social collaboration through these resources:

-  Integrated Collaboration for the Enterprise
-  Aligning Social Collaboration with Business Objectives
-  Transforming Sales Productivity with Social Collaboration
-  Inside IT Podcast: Transforming Sales Productivity with Social Collaboration

Find more at [intel.com/IT](http://intel.com/IT)



MOBILE

## Harnessing the Value of Touch and Mobile Computing

### Attracting the Best Talent Requires an Up-to-Date Fleet of Devices

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Hiring and retaining top talent is intensely competitive, and technology sector employees require great technology experiences through mobility, ease of collaboration, and a choice of devices. Recent college graduates, in particular, enter the job market expecting employers to provide these experiences, and providing these IT solutions is just one benefit that helps us attract talented candidates.

Intel attracts candidates and keeps existing employees satisfied and productive by empowering employees to choose the right devices for their jobs. We offer a variety of devices, including lighter, more capable mobile devices with a long battery life, the latest operating systems, and touch capabilities. These devices can transform the workplace by providing employees with a greater ability to work in a more flexible manner with optimum mobility and a better user experience.

Our studies confirm that “one size does not fit all” regarding computing devices across Intel’s varied work environments. About 80 percent of Intel employees currently use mobile computing devices in the workplace, and the majority of our PC fleet consists of Ultrabook™ devices or 2-in-1 devices. Touch-enabled Ultrabook devices with Intel® vPro™ technology, tablets, and 2-in-1s are proving valuable for both general office use and for specific use cases and workspaces across Intel.





# 90%

of Intel employees prefer  
**touch-enabled** business  
Ultrabook™ devices

Source: The IT@Intel paper "Accelerating Deployment of Touch-enabled Business Ultrabook™ Devices"

## Increasing Productivity with Touch-Enabled Business Ultrabook™ Devices and Tablets

In response to increasing employee demand for touch capabilities, we accelerated our deployment of touch-enabled business Ultrabook devices and applications, which has improved employee productivity and increased job satisfaction. Our studies indicate that in certain work environments, touch-enabled Ultrabook devices and tablets help employees get more done in less time.

Business Ultrabook devices and tablets with the latest operating systems offer the mobile productivity benefits of faster start times, improved battery life, and better responsiveness, all of which contribute to enhanced productivity. In an Intel proof of concept (PoC), facility technicians reported that the use of tablets increased productivity up to 17 percent based on the number of completed work orders. In addition, by using tablets to display online information, these technicians avoided having to print more than 300 pages per tool repair and performed their jobs 30 percent faster. In a another tablet PoC, which included not only facility technicians but also a more diverse cross-section of our highly mobile workforce, 80 percent of participants reported an increase in job flexibility and 57 percent reported an increase in productivity.

## Providing Mobility and Performance with Ultrabook™ 2-in-1 Devices

Ultrabook™ 2-in-1 devices can eliminate the cost associated with purchasing a companion device and reduce the cost and risk associated with keeping two devices in sync. We see 2-in-1s providing business value in many of our work environments such as Intel's factories. In these



### Benefits of Tablets in Facilities

 **17%**

Increase in productivity based  
on work-order completion

 **300  
PAGES**

Reduction in printing needs  
per tool repair

 **30%**

Faster facility technician  
job performance

environments, the lighter weight of 2-in-1s benefits employees, who must carry their computing device a significant amount of time but still need full-scale performance laptops.

We are currently conducting studies to show the full business impact of these devices and the value they can add. For example, separate from our previous tablet PoCs, we recently conducted a PoC in our manufacturing environment to determine how a 2-in-1 device compared with employees' previous laptop computers, how frequently employees used the tablet component, and how useful these employees found the tablet functions to be. The PoC revealed that employees who work both inside and outside the factory preferred a tablet configuration in several cases, such as when attending a meeting, performing tool maintenance, working in the field, or consuming content such as specifications and procedures. Employees preferred the laptop configuration (with keyboard) for extensive data entry and data analysis and other cases.

Based on these results, we are now offering 2-in-1s as a refresh option to manufacturing employees and are building toward a future workplace that incorporates many alternative form factors, including handhelds, tablets, and wearables, as well as many input methods, such as touch, voice, and gesture. In 2015, we will continue to investigate how innovations in mobile computing can improve employee productivity and attract the best and brightest talent to help develop tomorrow's technology.

## Transforming the IT Ecosystem to Support the Applications and Devices of the Future

We are encouraging the development of enterprise applications that meet five criteria that result in a better user experience and streamlined mobile application development: security, ease of use, platform independence, device independence, and support for emerging devices and interactions (such as touch). To support our developers, we have implemented a mobile application development framework that accelerates the delivery of secure mobile enterprise applications to Intel employees. At the end of 2014, we had nearly 150 touch-enabled enterprise applications in production and expect that number to approximately double in 2015.



### 2-IN-1



#### TABLET-LIKE CAPABILITIES

- Touch interaction
- Instant-on/quick resume
- Apps ecosystem
- Lightweight, thin design
- Long battery life



#### LAPTOP-LIKE CAPABILITIES

- Productive PC environment
- Standard PC applications
- Multiple input capabilities
- Multitasking environment

### Take Action

Learn more about what Intel IT is doing for mobility through these resources:

-  Factory Mobile Computing Proves Enterprise Value of 2-in-1 Devices
-  Deploying Windows\* 8 on Intel® Architecture-based Tablets: Intel's Approach
-  Accelerating Deployment of Touch-enabled Business Ultrabook™ Devices

Find more at [intel.com/IT](http://intel.com/IT)



## Delivering Insights Worth Millions through Analytics

### Increasing Intel's Revenue through Business Intelligence and Analytics

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In an age when organizations such as Intel are rich in data, finding value in this data lies in the ability to analyze it and derive actionable business intelligence (BI). Intel IT continues to invest in tools that can transform data into insights to solve high-value business problems. We have seen significant BI results from our investments in a number of areas.

### Boosting Sales With Reseller Market Insights

We developed a recommendation engine to help Intel sales teams strategically focus their sales efforts to deliver greater revenue. This engine uses predictive algorithms and real-time data analysis to prioritize sales engagements with resellers that show the greatest potential for high-volume sales. It also recommends optimal contact time and proposes products to offer to resellers to increase cross-sell and upsell opportunities. We saw USD 76.2 million in revenue uplift for 2014 through the use of this capability. This predictive analytics solution also garnered Intel the [2014 CIO 100 award](#) for creating business value through the effective and innovative use of information technology.



Intel is among the honorees of the 2014 CIO 100 Award for its predictive analytics solution. The 27th annual awards program, sponsored by IDG Enterprise's *CIO* magazine, recognizes 100 organizations that have distinguished themselves by creating business value through the innovative use of IT.



## Integrating Data for Faster, Better Decisions

Integrating multiple data sources has enabled us to use our decision support system to significantly impact revenue and margins by optimizing supply, demand, and pricing decisions. This capability helps our business management teams make critical decisions related to pricing, such as deciding when to raise or lower product prices and when to use rebates. It also provides cost avoidance opportunities by helping us better manage inventory allocations and optimize build decisions so that we properly balance supply with customer demand. This work resulted in revenue optimization of USD 264 million for 2014.



Increase in revenue through advanced analytics on supply, demand, and pricing

## Gaining Customer Insight with Web Analytics

Our big data platform for web analytics is yielding insights that enable more focused and effective marketing campaigns, which, in turn, increase customer engagement and sales. By enabling deep analysis of web usage, these web analytics provide a way to predict and adjust product positioning and pricing based on customer response to marketing campaigns. Intel's sales organization estimates that by the end of 2014, web analytics for demand generation campaigns created an ROI of millions of U.S. dollars.



Estimated value from pilot to reduce product test time

## Reducing Product Test Time

The exploration and implementation of Assembly Test Manufacturing (ATM) cost reduction initiatives involve complex algorithms and strong computation capabilities due to the high volume and velocity of data that must be processed quickly. The ATM data sets—containing up to billions of rows—cannot be effectively processed with traditional SQL platforms. To address this gap, we have implemented a reusable big data analytics correlation engine. This tool will support various high-value projects. The estimated value for the first of these projects, a pilot project for one of Intel's future processors, is greater than USD 13 million.

## Solving Intel's Manufacturing Group's Strategic Challenge

Our Apache Hadoop\*-based tool enables seamless and secure processing of high volumes of ATM data, which in turn supports various high-value projects targeted to reduce test time for Intel's manufacturing group.



Increase in revenue through the use of BI and analytics tools

We are exploring additional use cases for data collection and analytics across Intel's manufacturing, supply chain, marketing, and other operations to improve Intel's operational efficiency, market reach, and business results. In 2014 alone, Intel IT's use of BI and analytics tools increased Intel revenue by USD 351 million.



## Cooling and Electrical Density

for an 1,100 watts/sq ft cooling density and 1,300 watts/sq ft electrical density

Source: IT@Intel paper "Intel IT Redefines the High-Density Data Center: 1,100 Watts/Sq Ft"






increase in our Design computing environment created from four generations of high-performance computing

Source: IT@Intel paper "Intel IT's Data Center Strategy for Business Transformation"

### Take Action

Learn more about what Intel IT is doing with big data and analytics through these resources:

-  How Intel Implemented a Low-Cost Big Data Solution in Five Weeks
-  Maximizing Marketing Insight through Big Data Analytics
-  Using Big Data Predictive Analytics to Optimize Sales

Find more at [intel.com/IT](http://intel.com/IT)

## Accelerating Time to Market with High-Performance Computing

Being faster than the competition helps Intel capture market opportunities before our competitors can. Intel's growing portfolio of products in mobile, client, server, and the Internet of Things (IoT) market segments comes with a diverse set of market speeds and lifecycles. Getting to market faster is a significant advantage.

Recognizing the need to accelerate product development, Intel IT partnered with key design and manufacturing teams to reduce Intel's silicon product time to market by 12 weeks through the use of high-performance computing and data analytics.



- **High-performance computing.**<sup>2</sup> In 2014, we converted a 5,000-sq-ft wafer fabrication facility into a high-density data center. We deployed over 35,000 Intel® Xeon® processor-based high-performance, high-density servers in our 5 MW, extremely energy-efficient PUE 1.061 data center. These commodity Intel® architecture-based servers offer 51 percent higher performance per core than previous models, which enables us to significantly reduce the silicon design time. The higher cooling and electrical density enables us to support the large growth in compute demand associated with electronic design-automation tools.
- **Data analytics.** A System-on-a-Chip (SoC) design comprises many components and can include the processor, memory controller, graphics, and sound integrated on a single chip. Each of the components has its own development schedule, followed by integration and testing. Intel IT partnered with Intel's Silicon Design Engineering team to identify bottlenecks across the entire product lifecycle, characterize workloads, optimize test and validation cycles, and move massive capacity seamlessly across projects, teams, and geographies to accelerate key phases of the chip design process.

The combination of shared high-performance compute capacity and data analytics has reduced the silicon design time. For example, instead of taking 4 to 6 days to complete a complex set of design jobs, now design engineers can obtain output in half that time.

<sup>2</sup> Discover: [Intel IT Redefines the High-Density Data Center: 1,100 Watts/Sq Ft](#)



## Increasing Business Velocity with the Cloud

**Business Partner, Technical Expert – Putting the Cloud to Work for Intel**

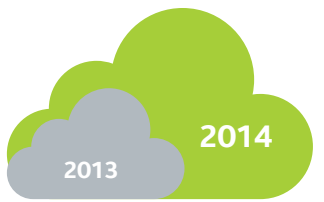
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To deliver the best possible IT services and solutions to Intel, we have transformed our IT culture to align with the strategies and imperatives of Intel's business groups. Intel IT brings our technical expertise and business acumen to bear on the highest priority projects at Intel to accelerate business at a faster pace than ever before. We have simplified the way Intel's business groups interact with IT to identify workflow and process improvements that IT can drive. Because we understand their businesses, we can tailor cloud hosting decisions (private, public, or hybrid) to specific business priorities.

### Accelerating the Use of Private Cloud

Our private cloud, with on-demand self-service, enables Intel business groups to innovate quickly and securely. Our focus on open-standard cloud technologies simplifies and accelerates our business users' consumption of private cloud services. We deliver more than 85 percent of new services in the cloud for our Office, Enterprise, and Services





17% ↑  
OS Instances

Our private cloud saves approximately USD 7.5 million annually while supporting an increase in use

data center environments.<sup>3</sup> We attribute the success of our private cloud to implementing a provider-like cloud hosting strategy, advancing self-service infrastructure as a service and platform as a service, and enabling cloud-aware applications. Our private cloud saves about USD 7.5 million annually while supporting an increase of 17 percent in operating system instances in the environment.



"The IT team working with Intel Federal are all 'get it done type of people.' The expertise is there, and the depth of knowledge. You never hear anybody celebrating their skill sets, they just get the job done...It's not only the quality of the team but the way they work that's impressive."

**Dave Patterson**

Vice President, Data Center Group President, Intel Federal LLC

## Making Applications Smarter

Cloud-aware applications can maximize cloud advantages such as self-service provisioning, elasticity, run-anywhere design, multi-tenancy, and design for failure. To enhance Intel developers' skill sets, in 2013 we delivered 8 code-a-thons in 3 geographical regions, training over 100 Intel developers in how to build cloud-aware applications. In 2014, we released design patterns that developers can reuse for aspects of cloud-aware infrastructure. By increasing interoperability between private and public clouds, this approach of designing cloud-aware applications has moved us closer to a federated, interoperable, and open cloud that is agile and cost effective.



## Our Journey to Hybrid Cloud

To increase our understanding of how hybrid clouds can benefit Intel, we are conducting a hybrid cloud PoC using open source OpenStack\* APIs. Hybrid cloud hosting can provide additional external capacity to augment our own private cloud while enabling us to optimize our internal capacity. Hybrid cloud hosting also increases flexibility, allowing us to dynamically adjust capacity when needed to support business initiatives efficiently.

We have accelerated hosting decisions for our business customers by developing a methodical approach to determine the best hosting option. We consider security, control, cost, location, application requirements, capacity, and availability before arriving at a hosting decision for each use case. Offering optimized hosting solutions improves business agility and velocity while reducing costs.

### Take Action

Learn more about what Intel IT is doing with cloud through these resources:

-  Making Private-Public Cloud Decisions on the Way to a Hybrid Cloud
-  Simplifying the Path for Building an Enterprise Private Cloud

Find more at [intel.com/IT](http://intel.com/IT)

<sup>3</sup> We group our data center infrastructure environment into five unique verticals that represent main business-computing solution areas (referred to as DOMES): Design, Office, Manufacturing, Enterprise, and Services.



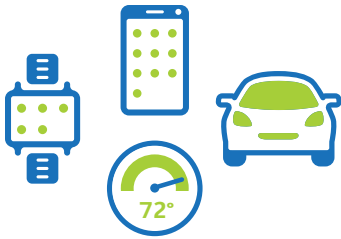
## INTERNET OF THINGS

# Transforming the Enterprise with IoT

## Creating New Business Models with Intelligence Everywhere

The number of objects sharing data in the IoT is expected to grow from 2 billion in 2006 to 50 billion by 2020. With smart, networked objects securely connected to the intranet, the power of the IoT is achieved through acquiring data, analyzing data, and ultimately taking action on data to drive new services and value streams for the customer. Introducing the IoT into Intel's business computing environment brought flexibility, agility, scale, efficiency, and productivity to our factories, buildings, and data centers. To maximize the transformational power of the IoT, we continue to integrate our enterprise systems and components based on the following requirements:

- **Security and privacy.** IoT solutions must support enterprise-level information security and governance, such as device trust, integrity, and verification; data protection; device and network access models; and data policy models.
- **Secure wireless connectivity.** Wireless LAN integration and node scaling, sensor edge-based wireless infrastructure, and gateways must be simple to set up and integrate with our existing network infrastructure and access points.



The IoT expands the idea of the computer beyond servers, laptops, smartphones, and tablets to include everyday items such as household thermostats, parking spaces, cars, refrigerators, and more.

- **Operations and management.** To offer optimal business value, our IoT solutions must integrate seamlessly with operations, services management, device provisioning, and management systems.
- **Data management and APIs.** IoT solutions must support common and unified data management for enterprise consumption, and data services for administration and developer services.

### Top 4 Requirements for IoT Enterprise Solution Integration



Security  
and Privacy



Secure Wireless  
Connectivity



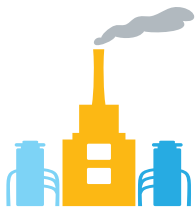
Operations and  
Services Management



Data Management  
and APIs

The following applications demonstrate our progress and the potential benefits of the IoT at Intel. These applications also show how we are accelerating Intel's vision of a smart, connected world.

### Smart Factories



30 M<sup>USD</sup>

Estimated Output  
and Yield Increase

after introducing the IoT and  
associated analytics in Intel's  
assembly and test factories

We are enabling new business use cases by offering training and pilot environments for high-velocity experimentation. In one use case, collection and analysis of pressure variation using the Intel® IoT Gateway enabled yield improvement in one manufacturing operation. In another use case, predictive triggers for electromechanical parts failure in complex test equipment helped to improve output and yield. Proliferation of these use cases is underway, with a projected business value of USD 30 million.

We are optimistic about the prospects of extending the use of the IoT and analytics in manufacturing operations to decrease operational cost and improve yield. We have also implemented a demo environment for sharing manufacturing use cases with external partners. This demo environment showcases components of the solution stack, including gateways and Apache Hadoop\* used for analysis and data visualization.

### Smart Buildings

We have successfully completed an initial deployment of the Intel® IoT Platform within our enterprise environment by integrating sensors, gateways, data ingestion, API management services, and analysis reporting. In collaboration with Intel's Internet of Things Group and Intel Labs, we automated the process for pairing motion, temperature, lighting, and door sensors with Intel® Quark™ processor-based gateways and created an overlay network on the existing enterprise Wi-Fi\* network for the IoT



devices, fully integrated with enterprise security protocols (for example, Wi-Fi Protected Access and 802.1x).

## How Can Smart Buildings Improve Productivity?

As a starting point for exploring how we can put the Intel IoT Platform to work in Intel's buildings, we conducted a PoC focused on enabling real-time detection of conference room occupancy. The goal was to increase conference room use and save employees time when they look for available conference rooms. A recent Intel campus study revealed that the average employee spends 3 minutes per day looking for a conference room, and based on a separate campus study we estimate that the lack of a real-time room availability system results in an average loss in site-wide productivity of 11,400 hours per year.

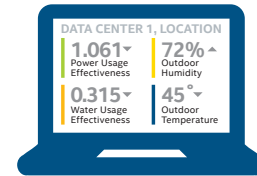
The smart buildings PoC has led us toward a common, scalable reference design that can be repurposed throughout smart buildings—demonstrating the ability of the Intel IoT Platform to enable broad building use cases, including intelligent automation, asset utilization, energy efficiency, and employee productivity.

## Smart Data Centers

The IoT provided unique insight on reducing the environmental and cost footprint of data centers. We placed wireless sensors throughout a data center facility to measure and manage environmental infrastructure more efficiently. Sensors gathered information about humidity, power demand, water temperature, air pressure, and more. We integrated the power demand data with Intel® Datacenter Manager, a rack and server management utility, that focus on traditional IT rack and server management, allowing us to leverage the IoT to extend and unify our view of the data center and perform end-to-end data center optimization.

We created a baseline of our engineering calculations and assumptions using detailed field measurements gathered from several hundred sensing points within our data centers. Data analysis identified non-intuitive changes to our existing room power, space, and cooling infrastructure, enabling us to design a free-cooling data center with an average PUE of 1.07, cutting annual power costs by hundreds of thousands of dollars. Using our set point analysis and the data we have gathered, we are designing a new data center that uses a 100-percent water cooling solution with a calculated PUE of 1.08. We are currently integrating analytics into the PoC and anticipate that this capability will enable improved data center efficiency and reduce operational costs.

In 2015, we plan to continue to pursue IoT-based innovations at Intel for a variety of applications: smart buildings, data center efficiency, factory optimization, supply chain optimization, and mobile worker productivity.





## 1.07<sup>PUE</sup> Free-Air Cooling Data Center

identifying and integrating non-intuitive changes through the use of the IoT using environmental sensors and data analytics

### Take Action

Learn more about what Intel IT is doing with the Internet of Things through these resources:

 Inside IT: Preparing for the Future with the Internet of Things

 IT Business Value: My Connected Life

 Preparing the Enterprise with the Internet of Things

Find more at [intel.com/IT](http://intel.com/IT)



SECURITY

## Making It Safe for Intel to Go Fast

Security Underpins Every Innovation at Intel

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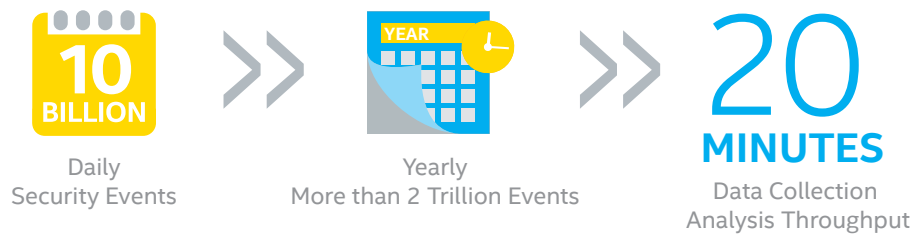
Intel's innovations and business transformations through the use of social, mobile, analytics, cloud, and the Internet of Things have an important detail in common: the need for security. Building resilience into today's digital enterprise requires the ability to anticipate, prevent, and respond to cyberthreats. Intel IT's Security Business Intelligence (SBI) platform reduces the time it takes to detect threats. This platform combines critical building blocks to create real-time and historical views of the environment, enabling security analysts and investigators to answer questions in minutes rather than weeks.

Intel's Information Security team continues to extend the SBI platform with new detection capabilities based on new event sources, new sensor technologies, and advanced analytics developed with internal partners, such as Intel Security and the Data Center groups as well as external partners such as Cloudera.

The SBI platform distills and filters over 10 billion events per day and holds a rolling year's worth of data—more than 2 trillion events in 3.5 petabytes of compressed storage. This platform brings tremendous value to the enterprise by reducing the time required to identify and investigate malicious activity and respond to potential

threats. For example, for a specific threat or incident, the SBI platform reduced the data collection analysis throughput from 2 weeks to 20 minutes. This sort of agility has transformed the security landscape at Intel.

### Identifying and Investigating Malicious Activity



These are Intel IT's SBI platform's primary results:

- Use of big data and advanced analytics to create contextual cyberintelligence, thereby improving Intel's ability to detect and respond to cyberthreats
- Development of the tools and reporting capabilities to distill large amounts of data into meaningful analysis of security events without overwhelming Intel's Cyber Security Center
- Reduction or elimination of security controls that may be less effective, reducing costs

Advanced security capabilities routinely raise challenges and concerns about privacy. The sheer amount of aggregate data can potentially expose sensitive data that could be used maliciously. To address these concerns, from the beginning of the project we built privacy controls and governance into the SBI platform.

## Protecting Personal Privacy

During the design phase, we provided the appropriate IT team members, such as architects, developers, and system administrators, with information about how to apply Intel's well-established privacy principles. We then implemented policies and processes to help institute appropriate governance of personal information throughout the data lifecycle—that is, through collection, storage, analytics, reporting, and eventual deletion.

With our SBI platform, security responders ask questions and the platform generates fast, actionable answers. With this data, the team can make informed decisions, identify actionable threats, and respond quickly, thus helping to mitigate enterprise risk and increase data protection.





1,000x  
FASTER

Data analysis throughput time decreased from 2 weeks to 20 minutes using our SBI platform

### Take Action

Learn more about what Intel IT is doing with security through these resources:

 Fast Threat Detection with Big Data Security Business Intelligence

 Inside IT: Security and Business Intelligence

Find more at [intel.com/IT](https://intel.com/IT)

## Looking to the Future

The IT industry has moved beyond categorizing new technology challenges as either IT problems or business problems. Business groups and IT must work closely together to implement the technology improvements and business process changes required to take full advantage of new market innovations.

By remaining aligned to Intel's highest priorities, Intel IT is driving business outcomes through our ability to leverage social, mobile, analytics, cloud, and the IoT trends in Intel's processes. As we move up the IT leadership pyramid, we are helping Intel disrupt instead of being disrupted in this time of transformation, and we are earning the right to influence decisions as a trusted partner.



## Take Action

Keep an eye on the future by joining us on our journey at [intel.com/IT](http://intel.com/IT).

Engage with our IT leaders and subject matter experts in the [IT Peer Network](#).

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