IT@Intel White Paper

Intel IT
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Enabling Global Collaboration with Intel®-based Infrastructure

With access to advanced collaboration tools deployed on Intel®-based infrastructure, Intel employees can easily and instantaneously share data, brainstorm new ideas, and work safely and collaboratively with team members and Intel's business partners around the world.

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Executive Overview

To enable a collaborative environment that helps Intel's workforce increase personal productivity, build stronger global teams, and work more effectively with external partners, Intel IT is deploying high-performance mobile business PCs, enterprise servers, and an advanced wireless network. This infrastructure, based on the latest Intel® processors and technologies, supports the high-speed transmission of data, voice, and video required by our current set of integrated collaboration tools and positions us to adopt new collaborative technologies in the future.

The collaboration tools we support fall into two categories: those that assist employees' personal productivity, and those that support formal team collaboration. Personal collaboration tools include instant messaging, personal bridge lines, and softphones; formal team collaboration tools include video and audio conferencing, shared content repositories, collaborative Web sites, webcams, and social media.

Internal and external collaboration provides many benefits to Intel:

- **Enhanced employee productivity.** For example, content sharing facilitates the ability to review, provide feedback on, and further develop work in progress.
- **Increased agility.** Collaboration tools enable employees to connect with team members in many different ways—on the road, in the office, and across time zones—reducing the need for face-to-face meetings while increasing Intel's agility.
- **Greater job satisfaction.** Team members report that being able to interact, see their remote colleagues' faces, and share data in real time enhances personal and team effectiveness while making their jobs more enjoyable.
- **Travel avoidance.** In 2010, videoconferencing saved more than 57,000 travel hours across about 6,000 meetings, avoided more than USD 26 million in travel expenses, and reduced our carbon dioxide footprint by more than 22,500 metric tons.
- **Support for business growth in emerging markets.** Collaboration tools help grow Intel's business in new global markets by cost effectively addressing these markets' often limited resources, lack of expertise, and geographical isolation.

With access to advanced collaboration tools deployed on Intel®-based infrastructure, Intel employees can easily and instantaneously share data, brainstorm new ideas, and work safely and collaboratively with team members and Intel's business partners around the world.

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The IT@Intel program connects IT professionals around the world with their peers inside our organization – sharing lessons learned, methods and strategies. Our goal is simple: Share Intel IT best practices that create business value and make IT a competitive advantage. Visit us today at www.intel.com/IT or contact your local Intel representative if you'd like to learn more.

BACKGROUND

Intel's 80,000 employees work from 143 sites in 62 countries. Project teams often are comprised of employees across multiple sites—in fact, two-thirds of Intel teams are virtual, and one-fifth of Intel employees have remote managers. Teams sometimes include external business partners.

Fifteen years ago, collaboration was cumbersome and inefficient. Employees had desktop PCs and phones with voicemail; they could print presentation materials for face-to-face meetings and share files using e-mail.

The virtual nature of Intel's teams fueled the need for tools that enable global collaboration.

Today, Intel employees have access to a broad spectrum of devices and applications that enable them to collaborate with colleagues and external partners around the world. Devices include smartphones, personal digital assistants (PDAs), and mobile business PCs. Softphone technology allows PCs to make telephone calls over the Internet. Employees can also access data wirelessly, and our collaboration applications support webcams, online meetings, and videoconferencing.

Collaboration is particularly useful in helping Intel grow its business in emerging markets. These areas, while offering great potential, often have limited resources and lack expertise. In addition, many are geographically isolated. Collaboration tools integrate a team located in an emerging market with teams in mature markets, enabling team members in these regions to have fast, low-cost access to expertise. Collaboration facilitates the constant flow of information and supports an "around-the-clock" engineering team concept, where some of the team sleeps while the rest keep working. This use of collaboration extends Intel's teams and reduces the cost of doing business.

Intel IT's ongoing role is to evaluate and deploy tools and services that continually improve real-time and asynchronous collaboration for Intel employees—and to make these tools and services widely available, secure, and easy to use while helping to proactively manage costs.

SOLUTION

To support both personal and team collaboration, Intel IT provides a secure computing infrastructure that uses the most efficient and advanced technology to deliver a broad, integrated set of collaboration tools. This enables Intel employees to work more productively and flexibly, while providing greater job satisfaction.

Personal productivity collaboration tools help individual employees work more efficiently. Key applications include Unified Messaging (UM), instant messaging (IM), and softphones. Team collaboration tools add a layer on top of personal productivity to specifically enable efficiencies for groups or communities. Teams require a set of tools that includes videoconferencing, audio bridges, and team data repositories. Some tools, such as webcams, are useful in both personal and team contexts.

Choosing the Right Infrastructure

Intel IT considers all of Intel's business needs—including global collaboration—when choosing components for our computing infrastructure. Intel's 80,000 widely dispersed employees collaborate using more than 90,000 PCs, which access more than 100,000 servers every day—usually over a wireless connection. A robust computing infrastructure—including a spectrum of computing devices, back-end enterprise servers, a wireless network, and telephony—supports global collaboration, as illustrated in Figure 1.

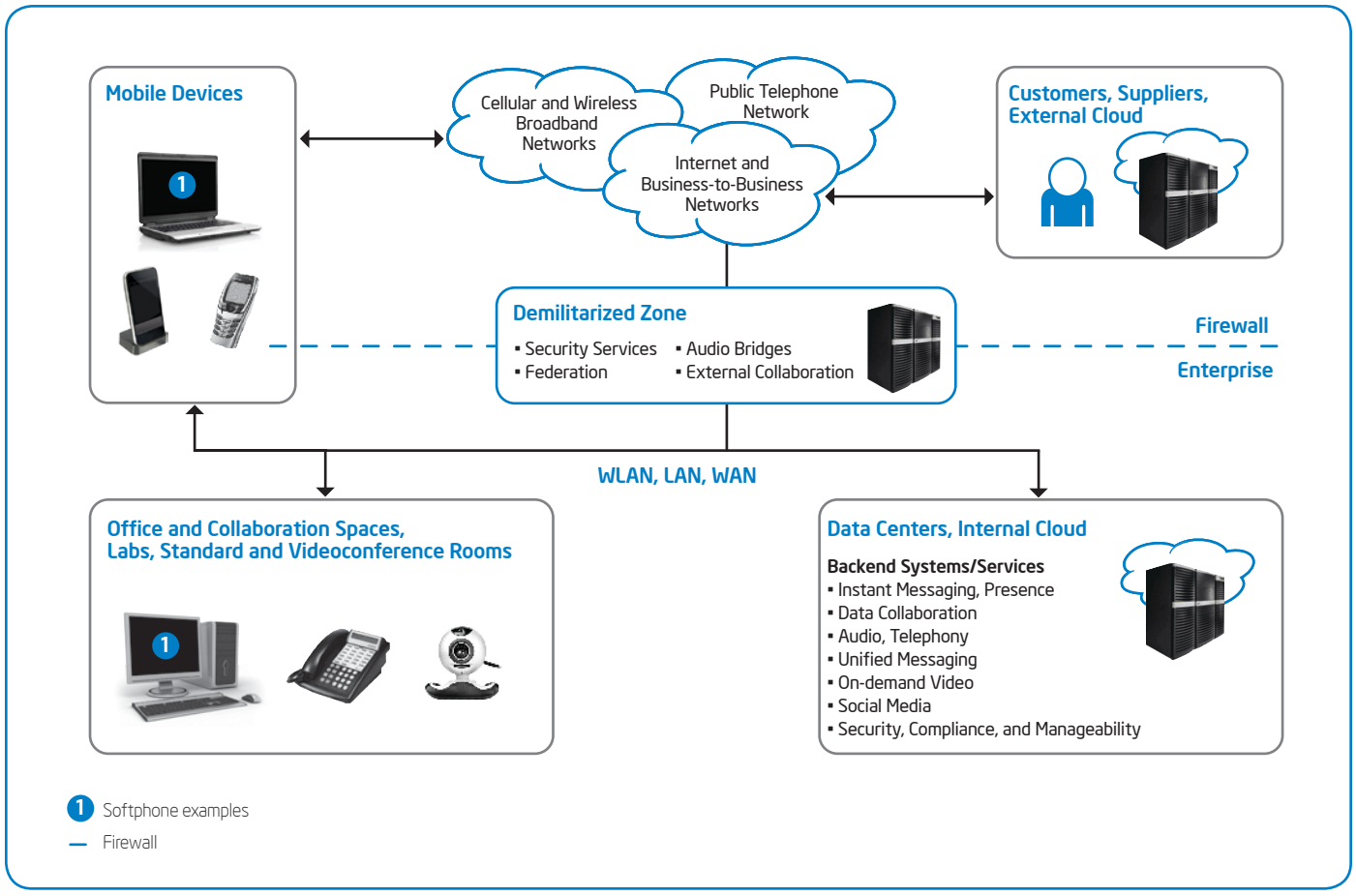

Figure 1. A capable, Intel®-based infrastructure can meet today's need for collaboration and support new collaboration technologies as they emerge.

Collaboration applications often have special infrastructure requirements, with regard to virtualization, server load balancing, network configuration, and physical location. For example, real-time collaboration client applications require local execution for the best user experience and are sensitive to client platform and network performance. Security is also a consideration, especially when collaboration centers on the development of intellectual property.

To enable greater unified communications capability and to control costs, Intel has been moving from legacy phone systems to a regional Voice over Internet Protocol (VoIP) model using Internet Protocol private branch exchanges (IP PBXs).

FLEXIBLE LOCAL COMPUTING PLATFORM

Intel IT recognizes that employees use a spectrum of devices to perform their work. Support for a variety of devices, primarily based on Intel® technology, increasingly requires seamless collaboration and data-flow from one device to another.

Mobile Business PCs

We deploy mobile business PCs equipped with high-speed Intel® Core™ vPro™ processors and Intel® Solid-State Drives (SSDs). We have found that the ability to perform local computing on the client offers the best user experience and the flexibility to run different types of applications—including those used for global collaboration.[1] Internal testing has shown that local processing is essential for real-time collaboration.

As example of how our PC fleet boosts collaboration, Intel held its first virtual Intel Sales and Marketing Conference in 2010. Mobile business PCs, with their robust feature set and high performance, enabled conference attendees to fully participate, just as if they were physically present. This virtual conference would not have been possible using thin clients or less powerful PCs.

1 "Better Together: Rich Client PCs and Cloud Computing." Intel Corporation, March 2009.

Companion Devices

In an environment of accelerating business cycles and geographically dispersed teams, Intel's employees have greater requirements for collaboration and connectivity—and they want the freedom to choose the devices that best suit their work styles. Following an extensive security review, Intel IT began allowing certain models of employee-owned handheld devices into our enterprise environment in January 2010.

In many cases, employees can use their own smartphones and tablets as companion devices to their mobile business PCs. For example, with appropriate safeguards in place to protect information and intellectual property, Intel employees can now use personal smartphones to access UM services. In the near future, they will also be able to use personal smartphones to attend online meetings, view employee presence status, and perform instant messaging.

Employee response to the personal device program has been overwhelmingly positive. At the end of 2010, our computing environment included approximately 20,000 handhelds, and about 8,600 of these were employee-owned. We currently do not allow personally owned PCs in our environment beyond certain tablets, but are investigating this possibility for contract workers.

WIRELESS NETWORK

Approximately 57,000 devices connect to Intel's wireless LAN (wLAN) every day. In 2010, we upgraded our wireless network from 802.11b/g to 802.11n to improve coverage and performance as well as the overall experience for end users. This provided a two-fold increase in performance at lower cost by reducing the number of wireless access points.

In 2010, we also upgraded our core WAN infrastructure, achieving a 13-fold increase in bandwidth without increasing overall cost. This provides the capacity to handle our rapidly growing requirements for high-definition video, high-quality voice traffic, and other business capabilities. The upgrade required significant network changes, including the replacement of older WAN technologies with new standards such as long-haul 10-gigabit Ethernet; we achieved this without downtime or service degradation.

SERVER ARCHITECTURE

The enterprise servers that underpin Intel's collaboration services are a major component of our collaboration infrastructure. They support:

- 18 million IM sessions per month
- 62 million online meeting minutes per month
- A software installation base nearly 1,700 applications, with 24 million downloads in 2010
- 5.5 TB of shared content on collaborative Web sites

Production servers based on Intel® Xeon® processors house the backend collaborative applications and storage. Our choice of up-to-date Intel-based server architecture enables us to meet current server traffic demand and accommodate future growth.

As part of our internal cloud and data center consolidation efforts, we are looking to virtualize as many applications as possible, provided the manufacturer has certified that the application can be virtualized. This includes applications for collaboration. Real-time applications present some unique challenges in a virtualized environment, because they are time-critical and therefore sensitive to outages. For example, a disruption that introduces latency and jitter significantly impacts quality in voice-based applications. Real-time applications pose other backend infrastructure challenges:

- They require prioritization in both the network and compute platform areas.
- They have special troubleshooting requirements, because any troubleshooting activity requires visibility into the end-to-end traffic and data transactions, which is more difficult in a virtualized environment.
- They also require more complex and stringent service-level agreements (SLAs).

When we load balance collaborative applications in a virtualized environment, we must consider that some real-time applications may have restrictions on where they are physically hosted. For example, some must be located near telephony equipment. We must also evaluate which services to co-host on a server, to avoid resource contention.

Tools for Personal Productivity

Collaboration tools such as IM, UM, personal bridge lines, softphones, and webcams enhance personal productivity by helping employees interact more seamlessly with colleagues and accomplish their jobs more efficiently.

INSTANT MESSAGING AND INFORMAL ONLINE MEETINGS

From the consumer perspective, IM allows people to "chat." But for Intel's employees, IM is a much more powerful tool. IM provides presence awareness—the ability to locate the person who can provide a necessary piece of information. Employees don't need to get up from their chairs and stroll the halls looking for someone, or make a phone call, leave a voice-mail message, and then wait for a response.

IM usage statistics provide evidence of how employees have embraced this technology. Every month, Intel employees initiate 18 million IM sessions. To further extend the productivity gains enabled by IM, we allow audio, video and/or data sharing abilities within IM so that employees can call a person from within an IM session or directly from the contacts menu.

Informal online meetings that include desktop sharing promote more effective small team discussions, co-authoring efforts, and support and training. Every month, Intel employees participate in 40,000 desktop sharing sessions that include three or more people.

UNIFIED MESSAGING

To avoid the costs associated with maintaining contracts for numerous disparate legacy voicemail systems and to improve employee productivity, Intel IT deployed a

UM system in 2009. Employees now use their mobile business PCs for all messaging—voicemail and e-mail—and can also access the system by phone while on the road. We estimate that moving to UM has helped Intel avoid about USD 1 million in costs related to legacy voicemail systems.

UM enables improved productivity for employees because they can access all messaging data, calendars, tasks, and contacts from a single software application on their computers or small form factor (SFF) device. With speech-to-text capabilities, users can read voicemail messages from their e-mail application.

UM's centralized management of various types of messaging and office data creates a much more streamlined environment for IT to support than multiple systems of dissimilar hardware and software. For example, if an outage occurs, we can use automated alerts and get service back online quickly.

Our UM system relies on PCs and servers based on faster new Intel® processors. For example, the system processes 15.3 million messages per day and blocks 2.4 billion spam messages per year—84.4 percent of all incoming e-mail. This level of usage puts a significant load on the backend servers.

Additionally, our UM system widely uses Extensible Markup Language (XML) throughout its suite of applications, which requires large amounts of processing power. Other UM features, such as text-to-speech reading of messages in a mobile environment, are also processor-intensive. Our mobile business PCs, based on the latest Intel® architecture, provide a better user experience than older, less powerful PCs.

SOFTPHONES

Advancements in the infrastructure for telephony have enabled us to extend the capabilities of the PCs in our environment. Employees can use one of several IT-sanctioned softphones, which are based on Voice over Internet Protocol (VoIP), to make calls from their laptop PCs to destination networks including Intel's private voice network and the public switched telephone network (PSTN). While softphones vary in levels of interoperability and features, in some cases, softphones can eliminate the need for desktop and cellular phones. We have deployed more than 8,000 noise-cancelling USB headsets and expect to continue the rollout of additional headsets during our standard PC refresh cycle.

WEBCAMS

Webcams offer a viable alternative to meeting in person for dispersed teams. Using a webcam, remote managers and their employees can hold virtual meetings, which can increase the sense of personal engagement.

Webcams can add this same personal connection to informal video and data sharing sessions that do not occur in a videoconferencing room. Employees can use their webcams to "put a face to" who is speaking during the meeting. Users report that being able to see who is speaking increases their ability to focus and participate, even in informal or impromptu meetings.

Collaborating for Team Productivity

We have deployed several technologies to extend team collaboration, including videoconferencing, audio conferencing, shared content repositories and collaborative Web sites, webcams, and social media.

VIDEOCONFERENCING

Videoconferencing is a viable alternative to expensive travel and provides an array of benefits:

- Reduced travel costs.
- Changed meeting behavior; employees automatically consider videoconferencing instead of travel.
- Increased attendee focus and accelerated decision making, as well as reduced time to develop teamwork and trust.
- Enhanced global collaboration.

We have an array of videoconferencing rooms that address the varying needs of sites and teams. Videoconferencing is easy to use because employees can schedule a conference directly from their e-mail application.

There is significant demand for new videoconferencing rooms. At the beginning of 2010, we had 17 videoconference rooms; we will finish the year with more than 70. To determine where to locate new rooms, we analyze travel patterns and room requests from various business units. We also consider a team's specific need for collaboration.

AUDIO CONFERENCING

Due to the sensitive nature of Intel's business and a strong need for intellectual property protection, historically, we have relied exclusively on scheduled bridges, which provide access to a conference line for a specific date, time, and duration. Over time, our organization has worked with Intel Information Security to establish personal bridge lines as an auxiliary service with certain controls in place. These reservationless bridges are used for specific types of meetings only. This approach has allowed IT to realize the productivity gains inherent in reservationless conferencing without compromising information security or protection of intellectual property.

Intel employees have enthusiastically adopted this new capability within the framework of the security guidelines, such as the recommendation to only use personal bridge lines for internal meetings. Intel employees use their personal bridges to make about 10,000 calls per week, which equates to about 1.5 to 2 million minutes each week.

Formal audio bridges—which are separate from ad-hoc hard phone, softphone, and IM conferencing—are an essential part of Intel's collaborative endeavors. Because our audio bridge service is so integral to how Intel employees work, we require the service to have an uptime of greater than 99.99 percent. Employees use about 10 million minutes of audio bridging every week. This figure includes both scheduled and reservationless bridges.

Videoconferencing Provides Significant Cost Savings

In today's economy, Intel is looking for every possible way to reduce costs, without sacrificing the quality of products and services or employee satisfaction. Videoconferencing is one way we can meet this goal.

In 2010, videoconferencing saved more than 57,000 travel hours across almost 6,000 meetings, avoided more than USD 26 million in travel cost, and reduced Intel's carbon dioxide footprint by more than 22,500 metric tons, as illustrated in Figure 2.

Figure 2. Videoconferencing has saved Intel more than USD 26 million and reduced our carbon dioxide footprint significantly.

SHARED INFORMATION REPOSITORIES AND COLLABORATIVE WEB SITES

We have developed shared information repositories and collaborative Web sites that simplify content management and project workflow. Team members can store and share documents, meeting agendas, and minutes; create content; track comments; and institute version control. We provide separate services for internal teams and teams that include external business partners; these services also include security features that restrict access to content, protecting Intel and our business partners' intellectual property.

We currently support about 6,700 site collections—groups of Web sites that have the same owner—and 11,500 personal sites—which enable employees to view and contribute to their organizations' intranets. Together, these sites contain 5.5 TB of content, and this number grows each day.

WEBCAMS

In the context of team collaboration, webcams enable employees to attend remote meetings, present information to colleagues, and work with external business partners. Anecdotal evidence suggests that online meetings that feature speaker video seem to increase meeting attendees' attention and focus.

Employees can also use their webcams, PC microphones, and recording software to make videos for documenting information-sharing sessions and distributing business and team updates.

SOCIAL MEDIA

Intel IT has implemented an enterprise-wide social computing platform that combines professional networking tools with social media such as wikis and blogs, and securely integrates with existing enterprise software and processes. Our goal is to transform collaboration across Intel by helping employees to find information and expertise more quickly, increasing interactive collaboration, breaking down silos, spurring radical innovation, attracting and retaining new employees, and capturing the tacit knowledge of existing employees.

Future Plans

Collaboration will continue to be an important focus for us. Our long-term vision is unified communications and collaboration (UCC), which is an evolving framework to automate and unify all forms of human collaboration and communications. UCC will provide a common experience across all business contexts and devices. Through UCC, we expect to deliver more agile integrated collaboration solutions so that Intel business groups can collaborate securely with each other, suppliers, partners, and customers.

INFRASTRUCTURE MODIFICATIONS

- **Device-independent mobility.** We will continue to allow more personal devices in the enterprise, enabling employees to choose the device that fits their needs and work styles most efficiently. Common collaboration services will be defined across the spectrum of devices, addressing challenges such as whether it is best to integrate each device natively or through a service layer. This may involve employing new compute models. Real-time collaboration applications have special needs in terms of platform capability and performance, which makes it desirable to compute on the local platform for the best user experience.
- **Remote PC management.** Intel® Active Management Technology (Intel® AMT), a feature in Intel® vPro™ technology, will enable better, more collaborative PC management by enabling service technicians to fix the majority of problems remotely, even if the OS is non-functional. That is, the service technician's PC can essentially collaborate with the malfunctioning PC.

PERSONAL COLLABORATION ENHANCEMENTS

- **Virtual personal conference rooms.** Currently in the concept phase, these highly interactive virtual meeting places will resemble physical meeting rooms, integrating real-time collaboration capabilities such as voice and video as well as document and multimedia content sharing, presence, chat, and social capabilities. Virtual rooms will typically be dedicated to specific teams and will persist between scheduled meetings.
- **Federated IM.** We have already federated with more than 100 companies, including some public IM applications. We will continue to federate with specific IM applications that meet our stringent security requirements. Our goal is for Intel employees to be able to send an IM to almost anyone with voice and video, independent of which IM client they use.
- **Softphones.** We are exploring the use of mobile video phone (MVP) capabilities as an alternative to traditional audio conferencing. This would allow employees to make and receive calls, quickly reach colleagues, and attend meetings without a separate phone whenever their PCs are connected to the Intel network. This technology has far-reaching productivity impacts. For instance, employees would be able to answer calls made to their office phone numbers, even when travelling.
- **Tool integration.** We are piloting a project that incorporates communication tools such as IM and blogs into employees' e-mail inboxes. For example, employees can initiate an IM from their e-mail client without switching tools. Our goal is to integrate functions so that users don't have to switch windows to accomplish a series of tasks. People are more productive when they can IM, read and send e-mail, or look up a department cost center code or time zone using a single application.
- **Context awareness.** We want to extend the concept of context awareness to stored content, which will return better search results for related content. We are also looking into using Really Simple Syndication (RSS) to develop a library of news feeds that will integrate with search capabilities.

TEAM COLLABORATION ENHANCEMENTS

- **Videoconferencing expansion.** In 2011, we will continue to deploy a broad network of videoconferencing rooms to Intel employees. We will also transition the ability to connect videoconference rooms with webcam video into our production environment, opening the door to more participants.
- **Electronic white boards.** These will enable collaboration and the ability to share hand-drawn brainstorming notes between sites in real time.
- **Enterprise video portal.** This will be an internal enterprise on-demand video sharing tool that will eventually replace our current small-scale video sharing site, which contains more than 1,500 videos of employee communications, training, and work efficiency "how to" clips.
- **Presence awareness.** We are implementing presence awareness for tools in addition to IM. For example, a content repository or social media site could indicate which team members are online and are ready to collaborate and communicate. By embedding collaboration capability directly into line of business applications, we hope to improve agility and support the growing needs of new business models, aligning with our UCC vision.

OTHER COLLABORATION SERVICES

- **Digital signs.** We plan to deploy a broad network of digital signs to broadcast news to employees, such as blood bank announcements and corporate, regional, and local content. These digital signs will serve as a public broadcasting function for each site. We are cooperating with Corporate Services in this effort by providing a backend content delivery network, infrastructure, and security.
- **Employee learning center training team.** This team's charter is to increase the productivity of all Intel employees through proficient use of IT-supplied office computing capabilities, which include collaborative Web sites, common desktop computing software such as e-mail and word processing, online meeting applications, wikis, softphones, and enterprise videoconferencing capabilities. By joining project teams, training team members can address specific challenges and needs.
- **Secure collaboration solution.** We are developing a new secure collaboration solution specifically targeted to silicon design engineers. We evaluated existing tools and then addressed gaps by customizing existing tools and educating product teams about how to use tools more effectively. This effort marks a significant new direction for Intel IT. In the past, we have designed and deployed tools for generic users; now we are identifying and accommodating the specific needs of user segments.

CONCLUSION

In an environment of accelerating business cycles and geographically dispersed teams, Intel's employees increasingly need to collaborate securely from anywhere, at any time, with others inside and outside the enterprise. Intel IT embraces technologies to provide efficiencies that enable connection and collaboration.

Collaboration offers many benefits, including enhanced employee productivity and computing agility, increased job satisfaction, greater external reach, and travel avoidance. Videoconferencing alone has saved more than 57,000 travel hours across about 6,000 meetings, avoided more than USD 26 million in travel expenses, and reduced our carbon dioxide footprint by more than 22,500 metric tons.

An Intel-based infrastructure, including PCs, WLAN, and enterprise servers, supports our current and future collaboration needs. For example, mobile business PCs with Intel Core vPro processors and Intel SSDs enable users to achieve productivity gains because their PCs are flexible and powerful enough to support real-time collaboration and advanced videoconferencing. Our recently upgraded and expanded wireless network enables our highly mobile workforce to access collaboration services, hosted on enterprise servers, at any time from anywhere.

The combination of advanced collaboration tools and this computing infrastructure enables Intel employees to securely share data, brainstorm new ideas, and work collaboratively—independently and in real time—with team members and Intel's business partners around the globe.

For more information on Intel IT best practices, visit www.intel.com/it.

ACRONYMS

CO_2	carbon dioxide
IM	instant messaging
Intel® AMT	Intel® Active Management Technology
IP PBX	Internet Protocol private branch exchange
MVP	mobile video phone
PDA	personal data assistant
PSTN	public switched telephone network
RSS	Really Simple Syndication
SSD	solid-state drive
SLA	service-level agreement
UCC	unified communications and collaboration
UM	Unified Messaging
VoIP	Voice over Internet Protocol
WLAN	wireless LAN
XML	Extensible Markup Language

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