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Integrated Collaboration for the Enterprise

Intel IT is integrating its collaboration tools with its business processes, providing an end-to-end experience for employees that is a natural part of their work environment.

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Executive Overview

Over the past several years, Intel has invested in collaboration tools, platforms, and processes to increase personal productivity and build stronger teams across the enterprise. The role of collaboration has become increasingly significant, being driven by business imperatives such as the need to integrate complex intellectual property from highly distributed teams around the world while increasing velocity and decreasing costs.

Now Intel IT is integrating its collaboration tools with its business processes, providing an end-to-end experience for employees that is a natural part of their work environment. Based on extensive employee research, we identified these main themes for collaboration:

- **Access to information and experts.** We envision secure information that employees and other users can easily create, find, and access. Additionally, we want external customers to be able to locate the pieces of information they need instead of having to search monolithic documents. Our collaboration tools should recommend relevant information and expertise based on the work of an individual, a team, or the organization. Examples include our content pipeline, mobile design center, and Expert Finder/Intel Recommender tool.
- **Asynchronous collaboration.** Asynchronous or “anytime” collaboration represents the digital workspace that enables individuals, teams, and organizations to find employees and collaborate regarding decisions, ideas, and deliverables at different times. Examples include ideation/crowdsourcing, project team workspaces, and our internal social and document sharing platform, Inside Blue.
- **Real-time collaboration.** We want teams to be able to collaborate even more effectively in real time, anytime, and anywhere on any suitable

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Acronyms

- SMAC** social, mobile, analytics, and cloud
- UX** user experience

device. Examples include audio (softphones and conference bridges), video services, digital whiteboards, and the physical environment of our conference rooms.

Our collaboration architecture provides a blueprint for integrating our diverse portfolio of collaboration tools with business-specific processes and applications. This integration focuses less on individual tools and capabilities than on providing a holistic collaboration experience aligned to business processes.

Business Challenge

To enhance employee productivity and deliver value to the business, Intel has made a significant investment in collaboration and computing tools, platforms, and processes. These efforts have led to solutions such as the creation of an Intel® architecture-based collaboration infrastructure, an internal social platform, and a sales collaboration model.

In 2013, Intel surveyed employees to evaluate opportunities and challenges for collaboration. Employees identified the following obstacles to collaboration:

- Difficult to find relevant people and content
- Not enough spontaneous interpersonal and visual interaction
- Difficult to coordinate across time zones
- Difficult to reach timely decisions and then locate records of these decisions
- Slow data transfer across regions
- Difficult to submit, evolve, and transition ideas to timely product innovations or solutions

Based on these obstacles, Intel IT initiated a total change management strategy aimed at removing these obstacles and creating a collaborative culture through communication, training, and incentives for employees.

Additionally, we set the following goals for our portfolio of collaboration tools:

- Provide value by integrating collaboration with business processes and business-specific capabilities
- Provide a holistic solution across the enterprise, reducing the focus on individual collaboration tools
- Become integrated with the way employees work—the key to enterprise-wide adoption

Solution

We envisioned a solution that removes obstacles to collaboration and meets our goals of providing an integrated portfolio of collaboration tools. As shown in Figure 1, we focused our solution in these areas: access to information and experts, asynchronous collaboration, and real-time collaboration.

Access to Information and Experts

Our integrated collaboration solution connects the right people and relevant information in a direct, timely manner. Additionally, internal and external customers benefit from content that is up to date, cost effective, agile, secure, and delivered to the right people at the right time.

Expert Finder/Intel Recommender

Expert Finder, a tool that started as a simple keyword search of manually maintained user profiles, enables employees to find the right experts, within and outside their workgroup, to help generate ideas and solve problems. In 2013, we increased Expert Finder adoption in the business and improved employee information by significantly expanding user profiles, reducing manual overhead, and incorporating simple recognitions. We also redesigned the user interface, which became an example for how to create and reuse modular user experience (UX) building

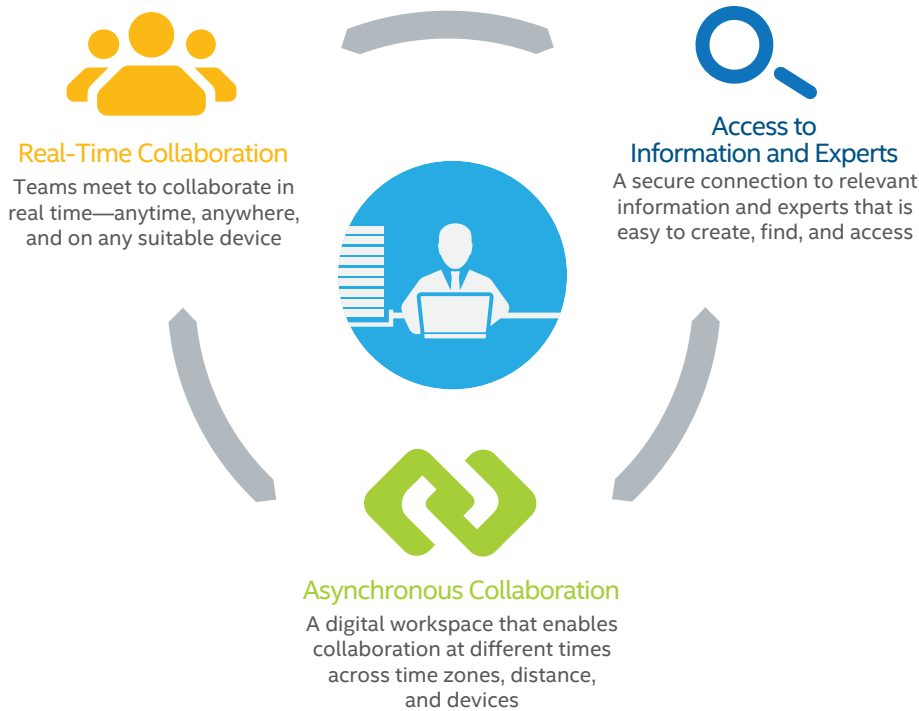


Figure 1. Our collaboration solutions provide a holistic experience across the enterprise, enabling employees and teams to locate and interact with the resources they need when they need them.



Figure 2. Our content pipeline enables us to author, store, and deliver reusable pieces of information to internal and external customers.

blocks. We plan to continue to evolve this capability by augmenting profiles with user information derived and auto-populated from other sources, enhancing expertise finding and matching algorithms to improve relevancy, and providing privacy controls that employees can set as preferences.

The Expert Finder is evolving to include the Intel Recommender, a tool that combines unified, automated user profiles¹ with other Intel resources such as content and project repositories, social discussions, and data systems. The goal is for this tool to be able to connect employees to experts, content, and professional social groups, all within the context of the employees' team and workflow. Filtering based on the context delivers recommendations and resources that are much more relevant than previous solutions could deliver.

Content Pipeline

The content pipeline comprises the full lifecycle for managing content, from creation, storage, and standardization to delivery, reuse, and obsolescence. Content, such as hardware architecture specifications and data sheets, is targeted toward Intel business groups such as manufacturing and sales and to external customers. Structured content provides pieces of information that are easier to locate and digest than large documents. As shown in Figure 2, the content pipeline consists of three main parts:

- **Intel Product Information XML.** The content authoring environment that some Intel architects, product engineers, and technical communications professionals use. This environment enables the authoring of modular content chunks and can provide up to 85 percent content reuse across Intel® products and platforms.
- **Reference Library.** Structured content is published to the Reference Library when it is ready for broader consumption and reuse. The Reference Library stores the approved versions of content, simplifies entitlement while preserving security, and enables relevant content to be easily found using flexible metadata. The Reference Library also serves as a staging ground for dynamic content delivery to external customers.
- **Dynamic content delivery.** Using modular XML and other content enriched with the right metadata, this delivery system enables the dynamic aggregation and delivery of relevant content chunks that are targeted to internal or external audiences. It also notifies content consumers when their content of interest changes, and it improves the search and navigation experience. This delivery system is a key component for the Intel® Mobile Design Center (see [Example: The Intel® Mobile Design Center](#)) to provide consumable content to smartphone and tablet OEMs.

¹ Intel IT worked with the security, privacy, and legal teams to define a policy for employees to opt in or out of sharing their profile data for expertise discovery. With the introduction of Intel Recommender, we defined additional privacy options for employees to allow their expertise to be derived from learning algorithms.



Example: The Intel® Mobile Design Center

The Intel Mobile Design Center is an example of how we have implemented the content pipeline and a workspace. The center provides resources—tools, firmware, and documentation—for OEM and original design manufacturer customers who are developing mobile devices based on Intel® platforms.

Our collaboration goal is to create a next-generation customer design center with modern navigation, design support, and dynamic content delivery. In the process, our solution enables the business to scale to the demand, delivering a better design experience with fewer engineering resources and reduced time to market for mobile devices.

To deliver dynamic content, we used our content pipeline solution to provide the following features:

- Scalable content delivery from the Reference Library to all Intel customers—both external and internal content consumers
- Dynamic and context-aware entitlement and access control solution
- Integration into the enterprise identity and access management environment (a unified experience with single sign-on)
- Compliance with all relevant legal, security, and privacy policies
- Improved user experience

We have initially completed this work for three mobile platforms, which we architected and designed to help ensure that we can extend and scale the solution across future mobile platforms and other product groups over time. This work furthers our goal of building a consistent design experience for our external customers and their diverse products.

Asynchronous Collaboration

Another aspect of our integrated collaboration solution is a digital workspace that—rather than limiting collaboration to times when employees can meet—enables our widely distributed employees to collaborate at different times across time zones, across distance, and across all their devices.

The digital workspace brings together everything a team needs to do their work and achieve value for the business, enabling teams to more effectively collaborate on decision making, ideas, content, and deliverables. The workspace contains modular collaboration building blocks, such as AR Tracking, Intel Recommender, notifications, activity streams, to-do lists, team discussions, meeting tools, business applications, WIP content tools, and the reference content. The workspace also enables teams to personalize the environment by integrating business-specific applications, optimizing the environment for their business requirements.

Additionally, we provide specialized capabilities for these areas:

- **Ideation/crowdsourcing.** Enables us to issue a challenge or a problem to solve at all levels of the organization—Intel-wide, within small teams or within larger business groups and divisions. For example, we conducted a crowdsourcing event to solicit ideas on how Intel can better take advantage of its employees' ideas for innovation.
- **Collaboration platform.** Provides an internal platform that brings together technology groups, forums, secure wikis, and enterprise RSS feeds. This platform enables easy self-service and personalization for teams and communities and can provide building blocks for the business-optimized digital workspace described above.

A key component of the platform is Inside Blue, a new, internal collaboration tool that provides an environment for collaborating on documents and participating in discussions without email. Inside Blue also provides a place for public posting of key messages, where employees provide feedback, discuss existing content, and create new discussions. Inside Blue is positioned as a tool for basic collaboration in contrast to the digital workspace, which has deeper integration with specific business processes and applications.

Real-Time Collaboration

Our integrated collaboration solution also must enable teams to collaborate in real time—meeting anytime, anywhere, and using any suitable device. These real-time meetings are transitioning from traditional telephony and a separate bridge system to integrated voice, video, and data conferencing.

Softphone and Conference Bridge

In 2013, we deployed a Voice-over-IP-based system for both softphones and conference bridges. Replacing the desk phones for 30,000 employees resulted in a one-time savings of USD 15.5 million and a yearly savings of USD 1 million, and replacing the bridge system resulted in a yearly savings of USD 4.3 million. Key features of these technologies include peer-to-peer unified communications, quick bridge access, and a replacement for desk phones for internal and external voice calls. The system also supports multi-party, multipoint unified communications. Further, employees find it easier to both schedule meetings and join meetings with a “single click” experience.

Although we have experienced initial challenges with audio latency and voice quality, our audio service has matured along with the technology. Overall, this transition from traditional desk phones has resulted in less complexity, reducing hardware requirements for wiring and dedicated physical devices and reducing maintenance overall.

Video Collaboration Rooms

In 2013, we upgraded our video infrastructure, moving from switching technology to multipoint conferencing technology. We made progress in deploying real-time immersive collaboration tools, including these:

- **Touch-based whiteboarding.** Digital whiteboards enable interactive creativity and annotation.
- **High-definition audio and video systems.** These systems include both single-screen and multiple-screen rooms optimized for sharing video and data and connecting face-to-face virtually.

During 2014, we started testing new concepts of integrated collaboration in various physical spaces such as labs, Agile development team rooms, and conference rooms. Our goal for such spaces is to enable more creativity with touch-screen focus for digital whiteboard and system interaction. These systems encourage spontaneous collaboration while supporting the scheduled meetings that are still the norm.

Currently, we are embarking on multiple pilots to integrate our client collaboration software with our existing video collaboration rooms and our new spaces as well as our email and calendar application. In the future, we plan to broadly deploy these capabilities to improve the UX for remote video participants and video scheduling.

Intel® Architecture: The Foundation of Our Collaboration Solutions

Using Intel® architecture enables us to provide the best collaboration solutions, resulting in increased employee efficiency and lower costs. Examples include the following:

- Servers for audio/video routing
- Voice over IP
- Servers for social media, analytics, email, calendars, and so on
- Ultrabook™ devices, desktops, tablets, and 2-in-1 devices for immersive, responsive user experience

Overall, Intel architecture-based devices, interoperating with tablets and smartphones, have enhanced employee productivity, leading to more effective meetings, communication, and collaboration. Intel architecture-based components have replaced the traditional proprietary telephony system, increasing Intel IT's efficiency and reducing the total cost of ownership for meeting capabilities.

Collaboration Architecture

As discussed in an earlier paper,² a robust Intel architecture-based computing infrastructure—including a spectrum of computing devices, back-end enterprise servers, a wireless network, and telephony—supports global collaboration, as shown in Figure 3.

User Experience Platform

The UX platform, illustrated in Figure 4, integrates business processes and business applications that many employees use every day (for example, issue tracking or customer relationship management) with collaboration capabilities. It provides the foundation for many of the collaboration solutions mentioned previously, using standards, reusable web services, and user interface widgets to integrate the components necessary for collaboration. For example, we plan to build the digital workspace on the UX platform (discussed in [Asynchronous Collaboration](#)), enabling self-service and personalization through standards-based modular UX building blocks. The UX platform includes third-party integrations, and we can easily extend it to legacy integrations as required.

Social, Mobile, Analytics, and Cloud (SMAC)

While we have made significant progress implementing social capabilities in our portfolio, more work remains to enable business applications with social features. Another key part of our architecture is to overcome the cloud and mobile obstacles by providing a consistent UX across multiple devices regardless of location. We want the ability to securely sync content, share documents with internal or external partners, and more.

² See the Intel IT white paper “Enabling Global Collaboration with Intel®-based Infrastructure,” January 2011.



Figure 4. The user experience platform integrates collaboration tools with the business applications that many employees use every day, enabling us to provide workspaces for individuals, teams, and organizations.

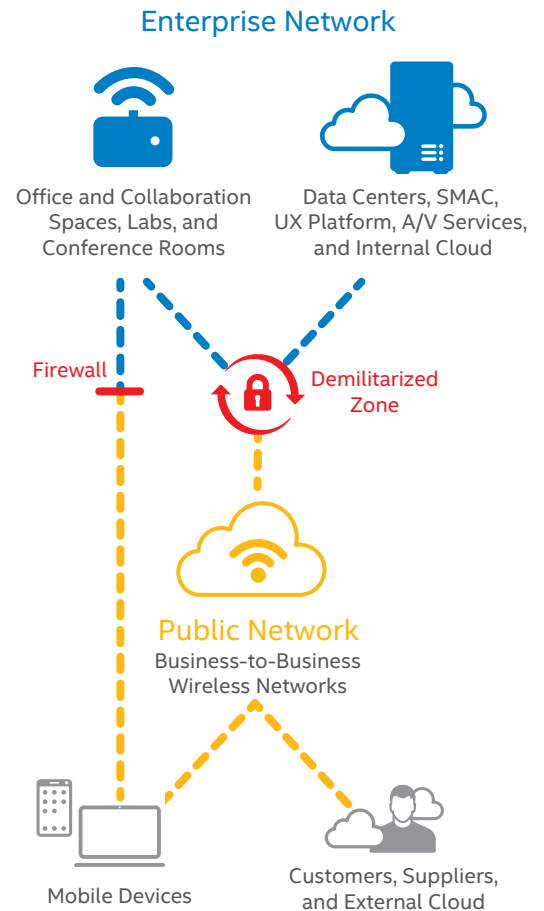


Figure 3. A capable Intel® architecture-based infrastructure can not only meet today’s need for collaboration but also support new collaboration technologies as they emerge. New to this infrastructure are two important additions: the user experience (UX) platform and the social, mobile, analytics, and cloud (SMAC) components.

Currently, we are working to virtualize our enterprise data and applications to the cloud so they can translate to multiple devices securely and consistently while following privacy and security policies to determine what data and applications can be accessed on which devices. We are also improving the look and feel of our applications by using responsive web design, HTML5, and CSS3 development standards augmented with native approaches as needed to satisfy usability expectations.

In the area of advanced analytics, we are feeding data from our collaboration systems into a big data platform. Performing advanced analytics on patterns of usage and performance in collaboration systems will help us improve the UX and provide insights into the adoption and business value of each collaboration tool across the entire portfolio. As we iteratively apply change management and efficiency interventions, we will continue to measure whether desired improvements have been achieved.

Key Results and Best Practices

Our efforts in each area of collaboration have yielded tangible results, as shown in Table 1. Overall, we have measured increased cross-business collaboration, more effective and easier-to-schedule meetings, and reduced overhead for Intel IT.

Table 1. Collaboration Solutions and Key Results

COLLABORATION SOLUTION	RESULTS	
Access to Information and Experts	Expert Finder	<ul style="list-style-type: none"> Increased search and expert-finding usage
	Content pipeline	<ul style="list-style-type: none"> Faster time to market and issue resolution Increased cross-business collaboration Improved content delivery to sales and customers
	Mobile Design Center	<ul style="list-style-type: none"> Improved content delivery to sales and customers Improved design experience with fewer resources
Asynchronous Collaboration	Ideation/crowdsourcing	<ul style="list-style-type: none"> Generated new ideas and developed them into innovative plans, processes, products and services, or used them to solve business problems
	Team workspace	<ul style="list-style-type: none"> Developed the Advanced Collaboration Environment (ACE) for Sales Conducted the Entry Smart Phone case study
	Social platform/ Inside Blue	<ul style="list-style-type: none"> Increased the numbers of participants and contributors Replaced monthly and weekly team status reports with secure status updates on the social platform
Real-Time Collaboration	Softphone and conference bridge	<ul style="list-style-type: none"> Saved USD 15.5M (first year) and USD 1M (subsequent years) by replacing desk phones Saved USD 4.3M by replacing the bridge system Integrated the experience with video and data sharing
	Video collaboration	<ul style="list-style-type: none"> Improved business relationships and trust Achieved a faster time to decisions Achieved a faster time to issue resolution during hardware validation Improved standup meetings for distributed Agile software teams
Collaboration Architecture	User experience platform	<ul style="list-style-type: none"> Improved productivity and business value from deeper integration with business processes
	Social, mobile, analytics, and cloud (SMAC) component (in progress)	<ul style="list-style-type: none"> Started to enable multiplatform, mobile-certified apps Started to enable business applications by enabling embedded social web services Started to collect analytics from each collaboration app to understand adoption and patterns across the portfolio Started to enable content and social platforms on the path to software as a service, spanning the internal and external cloud

We successfully implemented these collaboration solutions:

- Expert Finder
- Content pipeline
- Intel® Mobile Design Center
- Ideation/crowdsourcing
- Team workspace
- Social platform/Inside Blue
- Softphone and conference bridge
- Video collaboration
- User experience platform
- Social, mobile, analytics, and cloud (SMAC) component (in progress)

In addition to these results, as we have worked to provide improvements to our collaboration portfolio, Intel IT has identified the following best practices:

- Lead with business understanding and goals, not with the technology.
- Connect to a major business deliverable—for example, the Intel Mobile Design Center—for the most effective way to achieve collaboration.
- Align the technology solutions with the end-user and business pain points.
- Find strong sponsors and business resources to help.
- Plan for and implement a total change management strategy to increase adoption and ongoing engagement.

Next Steps

We have made progress in implementing our vision for an integrated collaboration solution. In the next two years, our roadmap includes more steps for making collaboration a natural part of Intel's day-to-day business processes.

In the area of access to experts and information, we plan to add the ability to deliver relevant, proactive recommendations based on the business context. Another feature we plan to add is derived expertise, which uses learning algorithms based on patterns of activity over time and approval of any derived skills or expertise. This feature builds toward the desired UX for “frictionless” information finding—that is, the ability to deliver on-demand, proactive information that is relevant to the work context.

For asynchronous collaboration, we plan to continue to develop team, role-based, and personalized workspaces built on the UX platform. We also plan to add a secure external collaboration tool using the software-as-a-service model.

For real-time collaboration, we plan to focus on providing an end-to-end meeting experience, from preparation and scheduling to the actual meeting and post activities. Further, we plan to implement standards-based video interoperability and the proliferation of a PC-based meeting infrastructure for conference rooms and labs.

In the area of architecture, we plan to continue to work toward the social enablement of apps so that they are supported on multiple platforms and mobile devices, enabled in the cloud and through software as a service, and delivered with analytics built in. We are also working on a consolidation strategy to eliminate redundancy across content and social areas.

Conclusion

To provide a holistic collaboration experience, Intel IT is focusing on three areas: access to information and experts, asynchronous collaboration, and real-time collaboration. Along with a total change management, UX, and SMAC strategy, our integrated solutions have removed significant obstacles to collaboration.

Our integrated collaboration solution focuses less on individual disciplines and tools than on an end-to-end experience for employees, who want to collaborate within the context of their daily workspace and devices. Using our Intel architecture-based infrastructure, our collaboration solutions have enhanced employee productivity and increased Intel IT efficiencies, leading to lower costs overall, increased velocity, and faster time to market. As we continue to integrate our collaboration solutions, we will incorporate metrics and goal tracking, aligning our solutions even more closely with our business processes to bring even more value to the enterprise.

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