



## IT@INTEL

# Best Practices: Deploying the Intel Unite® Solution

The Intel Unite® solution is modernizing Intel's conference rooms, transforming them into smart, connected spaces where employees—both inside and outside the room—can collaborate more productively.

**Dalit Codish**  
Intel Unite Solution  
Program Manager, Intel IT

**Scott McWilliams**  
Real-Time Collaboration  
Strategy & Architecture, Intel IT

**John D. Nguyen**  
Real-Time Collaboration  
Engineer, Intel IT

### Executive Overview

Effective collaboration between Intel employees enables them to share innovative ideas—a significant factor in Intel's competitive advantage. Intel IT has long been a key enabler of collaboration solutions for our enterprise and we continually seek ways to improve the experience for Intel employees, empowering them to bring their innovative concepts to life.

With our ongoing deployment of the Intel Unite® solution, we have made significant gains in making collaboration easier and faster. This solution has had such a positive impact on productivity that we have already deployed it to 3,500 rooms and plan to upgrade at least 4,000 conference rooms worldwide by mid-2017—representing a total potential savings of about 180,000 productivity hours. The Intel Unite solution is now standard for any new or renovated Intel facility.

The Intel Unite solution boosts employee productivity and enhances collaboration in the following ways:

- Eliminates cables, dongles, and adapters that make connecting devices to displays complicated. Meetings start faster and productive time is increased.
- Supports remote participation in the meeting by letting employees share content directly from their client device from anywhere in the world.
- Helps Intel IT keep conference room display-sharing fully operational through remote support and proactive issue identification and remediation.

Over the last 18 months, the Intel Unite solution was used by employees for 2.5 million presentations, representing nearly 922,000 hours of content-sharing.

Intel IT has developed best practices relating to preparation, deployment, and support of the Intel Unite solution. We hope other enterprises can learn from our experience and put our best practices to work in their own environments and transform their conference rooms into smart, connected spaces where employees—both inside and outside the room—can collaborate more productively.

## Contents

- 1 Executive Overview**
- 2 Business Challenge**
- 3 Solution**
  - Step 1: Preparing for the Intel Unite® Solution
  - Step 2: Building the Hub
  - Step 3: Deploying and Commissioning the Intel Unite Solution
  - Step 4: Supporting and Maintaining the Intel Unite Solution
- 13 Results**
  - Performance Testing
  - User Response
- 14 Next Steps**
- 15 Conclusion**

## Contributors

### Kaitlin Murphy

Workplace Transformation Marketing Manager, Business Client Platforms

### James M. White

IT Director, Real-Time Collaboration

### Bart Willett

IT Audiovisual Support Engineer, Intel IT

## Complicated Connections

The number of cables and adapters in conference rooms delayed meetings, frustrated meeting participants, and reduced the effectiveness of collaboration.



## Terminology

**Hub:** A hub is a Mini PC running the Intel Unite® application, which is installed in a conference room, huddle space, or other collaboration area and is equipped with Intel® vPro™ technology.

**Client devices:** End-user devices (regardless of form factor) that are running the Intel Unite application are referred to as “client devices” (shortened to “clients” in some cases).

## Business Challenge

Intel has fostered a culture that aggressively pursues innovation and focuses on efficient collaboration and the open sharing of ideas among employees and business partners. Intel IT is continuously looking for ways to use technology to improve the collaborative experience and empower employees to bring their innovative ideas to life.

Collaboration at Intel involves many factors, one of which is the sheer number of conference rooms. Worldwide, Intel campuses house at least 4,000 conference rooms that feature display capabilities, and that number is growing as we renovate facilities. Also, because Intel is a global company, meetings can take many forms. Some are highly structured with dozens of attendees from many regions. Others are impromptu get-togethers. Intel’s conference rooms must support discussions of all kinds and the easy sharing of content from laptops or other client devices—whether or not all participants are in the room or even at an Intel facility.

Historically, Intel conference rooms have featured a wide variety of configurations and cable connection options (HDMI\*, Micro-HDMI\*, DisplayPort\*, Mini DisplayPort\*, DVI\*, Mini-DVI\*, Micro-DVI\*, VGA\*, and so on) to try to accommodate all possible requirements. This reliance on hard-wired cabling presented meeting participants with many issues:

- **Connecting devices to displays was complicated.** Meetings were delayed and productive time was shortened.
- **Remote participation in the meeting was impeded.** Because audio or visual connections were not always readily available, remote participants contributed less than they otherwise might have, and what they did contribute sometimes required someone in the room to act as an intermediary, which slowed conversation flow and decision making.
- **Keeping rooms fully operational was difficult.** Because of their frequent use, cables often were misplaced or damaged.

Intel IT sought a way to increase meeting efficiency and to make it easier for meeting participants to securely share content from a PC or Mac\* by reducing the reliance on cables to connect to conference room displays and projectors.

## Solution

A wireless solution that would eliminate the collection of cables and adapters was clearly the best option. In our effort to make meetings run more smoothly with consistent, high-quality, and reliable wireless displays, we investigated several wireless solutions. We ultimately settled on the Intel Unite® solution<sup>1</sup> for the following reasons:

- It offers the lowest total cost of ownership (no recurring fees<sup>2</sup>).
- It is a single, common solution that we can easily customize to meet the needs of different conference rooms and the existing equipment in those rooms.
- It is an open platform that works with off-the-shelf PC peripherals and accommodates new features and capabilities without replacing the hardware, making new releases faster and easier and allowing reuse of audio-visual equipment already deployed in the enterprise.
- It provides an excellent user experience (see the [Results](#) section).
- It is easily scalable through the power of a “PC in every room” (see the sidebar [What a PC in Every Room Can Do for the Enterprise](#)). We have used the solution in a wide variety of collaboration spaces, including huddle spaces, collaboration rooms, and conference rooms.
- It can be easily managed remotely through the use of Intel® Active Management Technology (Intel® AMT), which is built into all PCs equipped with Intel® vPro™ technology (see the sidebar [What a Smart Conference Room Looks Like at Intel](#)).

We conducted several pilot projects with the Intel Unite solution in 2015 and are now in full production mode, using enterprise-level processes for all IT-managed systems in the conference rooms where the Intel Unite solution is deployed (currently about 3,500 rooms).

Using what we learned from these pilot projects, we developed a set of best practices to prepare for and deploy the Intel Unite solution. We deployed the solution gradually, starting with one U.S. location; then based on room prioritization criteria and room audits, we extended deployment throughout 2016 and early 2017. We hope that by sharing these best practices, other enterprises can more easily deploy the Intel Unite solution and can quickly begin to benefit from it.

As shown in Figure 1, our overall approach consists of four main steps:

1. Prepare
2. Build
3. Deploy and commission
4. Support and maintain

Our well-established and distributed PC support infrastructure helps us accomplish these steps efficiently with consistent results.

<sup>1</sup> For background information about the Intel Unite® solution, refer to the IT@Intel white paper “Conference Room Collaboration Using Intel® vPro™ Technology.”

<sup>2</sup> There are no license fees associated with the Intel Unite® solution. The software comes bundled with designated hardware, and feature updates are included to maximize the business value of the solution.

## Deployment Strategy for the Intel Unite® Solution



Figure 1. We divide our best practices for implementing the Intel Unite® solution into four main steps. Each step contains several tasks that help the entire implementation and ongoing support proceed smoothly and efficiently.

## Step 1: Preparing for the Intel Unite® Solution

Intel's workforce is highly mobile, and the majority of employees use laptops that connect to the corporate network using a Wi-Fi\* connection. Because of this heavy Wi-Fi traffic, we require extremely robust networks with stringent quality-of-service standards, such as less than 1-percent packet loss for wireless voice over IP (VoIP) connections. Therefore, we pay careful attention to anything we add to the environment that will use Wi-Fi capacity.

We undertake several steps to prepare our environment before we deploy the Intel Unite solution. First, we set deployment criteria and perform room audits and infrastructure characterization. This helps to identify gaps in network availability (LAN) and electricity, as well as other facilities issues in the room. For this step, we coordinate with Corporate Services (Intel's facilities organization). Subsequent steps include preparing the hub and client devices and training the Intel Help Desk staff.<sup>3</sup>

### Establish Deployment Prioritization Criteria and Roadmap

The following lists the criteria we have established that help us decide at which site, and in what order, to deploy the Intel Unite solution.

- **Coordinate with Corporate Services and IT Construction for new construction, renovation, and special projects.** We align our process with planned and funded renovation and construction projects to control costs, avoid repeated alterations to rooms, and make the transition as easy as possible for employees.
- **Consider the size of the site and the efficiency of the deployment.** We focus on large sites that bring economies of scale and can impact the most employees quickly.
- **Consider that Intel is a global company.** We deploy the Intel Unite solution to all geographies.
- **Match deployment capacity.** We verify that the desired deployment and timing does not exceed capacity or funding.
- **Focus on sites that have operations and support resources available.** We deploy first to sites that have dedicated conference room support engineering and operations staff.
- **Align with our other enterprise-wide initiatives.** Initiatives such as Workplace Transformation dovetail well with deployment of the Intel Unite solution.

### Perform Room Audits

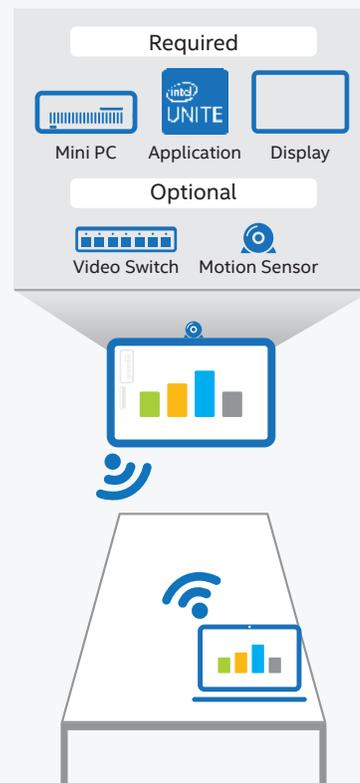
Before we deploy the Intel Unite solution at a site, we perform a thorough audit of each conference room. Room audits are performed in close collaboration with Corporate Services staff. Together, we assess each room's network connections, available displays and projectors, and existing wiring and ports in conjunction with the room's intended usage. For example, Corporate Services can assist us if a particular room needs cables to be run inside walls, or if a display requires specialized installation. In some cases, we may decide to upgrade some or all of a room's equipment, depending

### What a Smart Conference Room Looks Like at Intel

The basic Intel Unite® solution requires the following components:

- A Mini PC based on a 4th generation Intel® Core™ vPro™ processor or higher, running Microsoft Windows\* 8.1 or higher
- Intel Unite® application
- A display device
- Necessary cabling for video, network, and power

With these basic components in hand, the Intel Unite solution is easily customized. For example, some of our conference rooms include additional components that enhance the collaborative experience. Some optional components that we use include a high-performance HDCP\*-compliant video scaler/switch, a large-format HD display that can take advantage of full-HD and 4K resolution, and a USB PIR (passive infrared) motion sensor to sense when people enter the room and automatically activate the equipment.



<sup>3</sup> IT departments at smaller companies may not need to complete all these preparation steps or may be able to reduce their number, based on their specific IT and conference room environments.

on how the room is used and its existing equipment. In other situations, we can keep the existing equipment, because the Intel Unite solution is compatible with existing technologies.

Next, we divide the conference rooms into discrete categories (for example, we use size categories: small, mid-size, and large) and develop a diagram for each category (see Figures 2 and 3). We also develop a bill of materials and installation notes for each category. An important part of these diagrams is that they show the shared content control flow of the system components as well as the elevation view on the wall where all components get installed (hub, interfaces, power, network ports, and so on).

Depending on the room usage, we make decisions about cabling. Because the Intel Unite solution eliminates the need for cables, our goal is to install the minimum number necessary. These cables can be used to support legacy systems that need to connect without using the Intel Unite solution or as a redundant backup.<sup>4</sup> Not all rooms require using a cabling switch. For those that do require a switch, we have found that careful switch selection is important for reliable results.

### Prepare the Infrastructure

In addition to performing room audits, we prepare the infrastructure that will support the solution. This includes assessing the wireless network at a particular site and setting up the solution architecture.

### Assess the Wireless Network

As with any wireless solution, the performance of the Intel Unite solution can degrade if the network conditions are poor.

At every site where we plan to deploy the Intel Unite solution, we perform a thorough wireless network characterization to determine whether the network has sufficient capacity or needs to be upgraded. Our characterization includes determining the current amount and types of Wi-Fi usage at the site and how much latency already exists. Because Intel employees use VoIP as their primary phone connection method, it is important that the network have enough bandwidth and the proper channeling to assure the Intel Unite solution does not interfere with VoIP use.

We plan for growth and expanded usage when we deploy an IT solution. Therefore, we perform stress testing on the wireless network and evaluate how well the current network setup will scale. Based on the results of the wireless network characterization, we may upgrade the infrastructure in one or more of the following ways:

- Update the controllers
- Add or reposition access points to provide better coverage and balance the client load
- Change network segmentation to improve load balancing

Our goal is that once the Intel Unite solution is deployed across a floor or building, the quality-of-service indicators remain within the acceptable threshold.

<sup>4</sup> Intel IT prefers to use HDMI\* (digital) cable runs instead of VGA\* (analog) runs because we have observed that HDMI provides a much more consistent user experience.

## Intel Unite® Solution for Small Conference Rooms

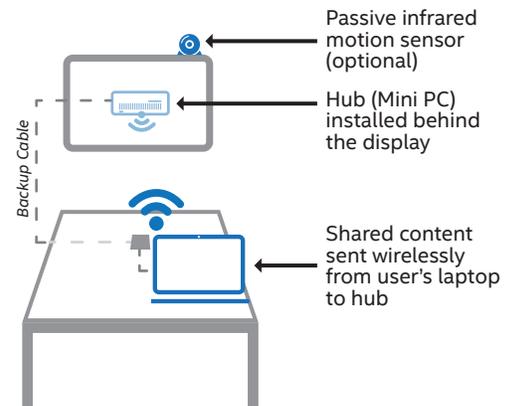


Figure 2. This diagram shows how the Intel Unite® solution is deployed in a small conference room at Intel. This type of room is basic, with simple cabling requirements. Backup cables are provided for high availability.

## Intel Unite® Solution for Large Conference Rooms

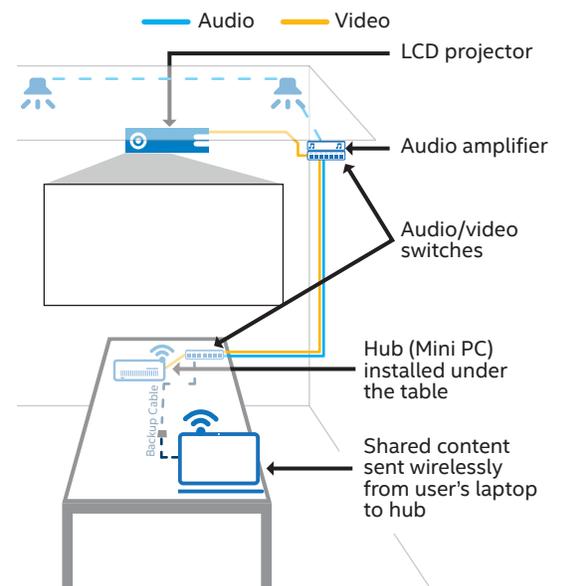


Figure 3. This diagram shows how the Intel Unite® solution is deployed in a large conference room at Intel, which uses a ceiling-mounted projector. This type of room uses additional components, such as an audio/video switcher, an audio amplifier, and ceiling-mounted speakers. Backup cables are provided for high availability.

### Set Up the Solution Architecture

When meeting participants enter a room equipped with the Intel Unite solution, they see a six-digit PIN on the room's display screen. They use the PIN to access the meeting. As shown in Figure 4, the hub obtains the PIN from enterprise PIN servers.<sup>5</sup> The PIN requests are routed through a network load balancer. We use a clustered virtual machine approach for the enterprise PIN servers, which will enable us to add more virtual machines if necessary as we expand the Intel Unite solution deployment. The enterprise PIN servers obtain the PINs from a high-performance, high-availability database cluster. It is important to note that shared content does not route through the PIN servers. It is routed in the most direct network path to the hub in the conference room.

### Prepare Employee Client Devices

The Intel Unite solution requires a set of minimum specifications for OS, RAM, and storage capacity on client devices.<sup>6</sup> At Intel these requirements are easily met by our standard build on all primary devices.<sup>7</sup> Early in our pilot projects we learned that it is important to keep client device drivers up to date. For example, we discovered certain wireless adapter drivers were remaining connected to one Wi-Fi access point, even when the signal became weak and a different access point was closer. This meant that when employees walked from their desk to a conference room, the signal would become very weak. With such low bandwidth, the presentation content lagged when they joined an Intel Unite solution session. To correct this situation, we deployed a wireless LAN driver update that switches more appropriately to an access point closer to the conference room, which results in a better signal and therefore better performance.

The Intel Unite solution is part of the client device refresh installation and is included in our standard build—helping to ensure that all personal mobile PCs have the Intel Unite® application installed. If for some reason a PC does not already have the app, aside from the minimum specifications and up-to-date drivers, the only other thing required for client devices is a one-time download and installation. This procedure, which takes less than two minutes, is typically performed when the employee enters an Intel Unite solution-enabled conference room for the first time. However, employees do not need to be in the conference room to download and install the software or to join a meeting.

Anyone with access to the PIN can join an Intel Unite solution session from anywhere in the world, as long as they are on Intel's network and have the six-digit PIN to join (Figure 5). This allows remote participants to see and interact with meeting content and to share their own content in the conference room display, which is an important benefit of the solution.

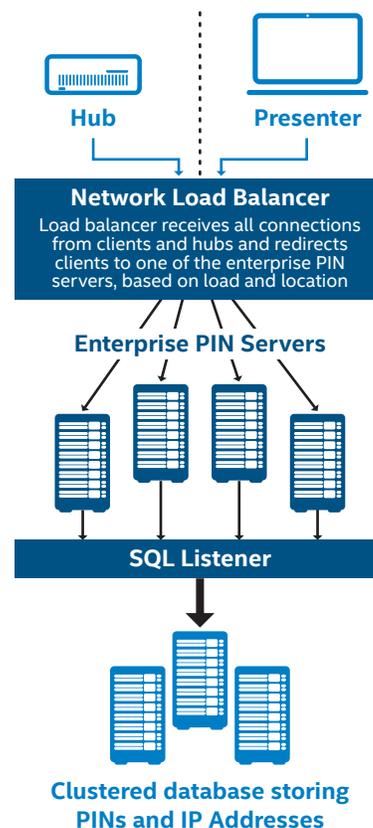


Figure 4. The Intel Unite® solution architecture at Intel uses clusters of enterprise PIN servers and database servers for high availability and redundancy. While this sort of fail-over capability may not be necessary for smaller deployments of the Intel Unite solution, in a global enterprise environment this approach is critical for the success of the deployment.

<sup>5</sup> Enterprise PIN servers are the servers that connect with the SQL database (which stores PINs and IP addresses) for key generation and queries. We use virtual machines for the PIN servers, so no additional server infrastructure is necessary. Also, we use multiple PIN servers to enhance redundancy and reliability.

<sup>6</sup> For the list of minimum component and system requirements, go to [www.intel.com/support/software/applications/unite/sb/CS-035669.htm](http://www.intel.com/support/software/applications/unite/sb/CS-035669.htm)

<sup>7</sup> A primary device is an Ultrabook™ device, laptop, tablet, 2-in-one device, or Mac® that the employee uses to complete day-to-day job duties.

## Prepare the Intel Help Desk

While we are readying the physical aspects of the Intel Unite solution, we prepare our IT support staff. They need to learn many new tasks, including what the Intel Unite solution is and what it does, how to interact with the Intel Unite solution interface, and how to troubleshoot issues when they arise.

Our primary training materials include the following:

- A self-paced course based on a slide presentation (complete with a training assessment and a course evaluation)
- Several knowledge base articles on our intranet
- Workflow documents that provide step-by-step instructions for troubleshooting various scenarios

We also encourage IT staff to take advantage of other resources, including discussion groups on Intel's intranet, end-user help portals, super-user forums, and general Internet resources.

## Step 2: Building the Hub

The hub must be prepared before we can install it in a conference room. This preparation involves several steps.

### Define a Default Welcome Screen

We used the central PIN server administration portal to define a default profile that controls how the welcome screen looks. The profile is automatically pushed to each hub when it is activated. In this way, all hubs in the same profile display the same welcome screen, an example of which is shown in Figure 5. The welcome screen is customizable and can display any text that an IT department wants. We designed the welcome screen to provide just enough information so that users can quickly get started without getting confused.

### Perform the Build Procedure

The following steps provide an overview of the build procedure. The detailed steps, including screen captures, for this procedure are maintained in an installation document used by Intel IT staff.

1. Prepare user accounts.
  - Non-privileged user accounts are created for automated login to hubs. We create one user account per floor per building. This strategy minimizes the number of accounts to manage and also reduces how many hubs are impacted if a problem arises with a user account.
  - We also create unique machine accounts. Account names include the building name and the conference room number. This naming convention allows for easy identification and physical location of a hub.
2. Install the base OS, Intel IT's required client software, and the Intel Unite application.



Figure 5. The customizable Intel Unite® software welcome screen directs meeting participants to the application download site and provides the PIN necessary to share content. With just a few clicks and in less than two minutes, meeting participants can begin to collaborate.

3. Secure and tamper-proof the hub.
  - Verify compliance with the minimum security standard.
  - Verify that the Windows\* OS has the latest updates and patches.
  - Install and update antivirus, anti-malware, on-access scanning, and intrusion prevention software.
  - Secure the UEFI (Unified Extensible Firmware Interface) boot by activating the secure boot option and disabling all legacy boot options (USB, network, and so on).
  - Enable the Execute Disable Bit option.
  - Enable Intel® Trusted Execution Technology (Intel® TXT).
  - Enable and set a master BIOS password.
  - Automate the login with non-administrative and domain least-privileged accounts.
  - Disable USB keyboard, mouse, and storage interfaces (intercept keyboard sequences such as Ctrl+Alt+Del, Alt+Tab, and so on).
  - Uninstall unnecessary software to reduce security risk vectors.
  - Disable unnecessary Windows components (such as Fax, Printing, and Location) to reduce security risk vectors.
4. Apply automated and non-intrusive security compliance and patching.
  - Suppress system alerts and popup messages.
  - Subscribe to nightly patching maintenance.
  - Prevent patching during working hours.
  - Select non-interactive patching.
  - Allow automated reboot as needed.
5. Prepare the hub for remote manageability by configuring Intel AMT.
  - Disable hibernation and standby timers.
  - Disable screensavers and display shutoff.
  - Provision Intel AMT for remote desktop access and power controls.
  - Lock access to authorized support groups only.
6. Implement monitoring and alerting (not included with the Intel Unite solution).
  - Enable system uptime indicators.
  - Enable system heartbeat for health tracking.
  - Enable self-healing processes (auto-reboot if the Intel Unite application crashes or the network becomes unavailable).
  - Enable automated alerting to the support group.
7. Connect to the LAN to get the best performance and user experience.
8. Once the hub build is complete, perform functional testing to verify that it automatically logs in with the generic account and launches the Intel Unite application.

To streamline the process we use automated scripts that perform many of the above steps, making the build procedure quick—we have reduced the build time to about 20 minutes (after the OS is installed) for each hub, and many can be built in parallel.

### What a PC in Every Room Can Do for the Enterprise

The Intel Unite® solution lays a foundation for a large variety of functionality that has never before been possible. Having a PC in every conference room enables Intel IT to continue to enhance room capabilities and user experiences through software—there is the potential to do anything that a PC allows using software and peripheral hardware combinations. Examples include videoconferencing, integration with unified communications solutions, digital whiteboarding with added touch screen(s), room lighting control, room occupancy detection, and more.

Although it may take us several years to reach it, our ultimate goal is to make every room smart enough so that it knows the employee and understands the context of the employee's meeting—to the extent that the room (according to user permissions) initiates the meeting as the employee enters rather than the employee having to initiate the meeting.

## Prepare for Support

These tasks help streamline the support of the hub:

- We create an unattended device organizational unit and add all hubs to it. This prevents patches or updates from being pushed to the hubs during work hours or when the device is in use. This organizational unit also prevents unauthorized keyboard and mouse connection, use of external USB drives, and access by non-IT administrators. Intel employees use the hubs in appliance fashion as a part of the Intel Unite solution but not as general computing devices.
- We define a naming convention that is used for all hubs. When an employee reports an issue that refers to a conference room, the Intel Help Desk can easily identify and remotely connect to the correct device.
- Once the Intel Unite application has been confirmed to be fully functional on a hub and the hub has been installed in the conference room, the IT technician sends an email to the appropriate support team. The email includes the hub's computer name and a request to add the hub to the IT tool that handles security patching.

## Step 3: Deploying and Commissioning the Intel Unite Solution

Several best practices guide where and how we deploy the Intel Unite solution, including establishing the following:

- A repeatable deployment process
- An organized approach to change management
- A set of metrics by which we can measure success

### Establish a Repeatable Deployment Process

The deployment process includes a well-documented room audit checklist (which is key for bill of materials creation and subsequent deployment steps) and network characterization, as well as carefully detailed build process for the hubs and installation procedures (Figure 6). In particular, technicians use a commissioning checklist to verify that a conference room is fully ready for production. Having this information helps keep the installations consistent across the deployment, whether at a single site or worldwide.

#### Room Commissioning Checklist

- Mini PC mounted securely behind or to the back of the display
- PIR sensor set at the top of display closest to the door (lens facing door) and test
- Ensure cable management is clean and tidy behind the display and/or floor stand, and at the table
- Ensure the HDMI\* dongle ring has DisplayPort\*, Mini DisplayPort\*, and Mini HDMI adapters
- Display settings complete and front-panel controls are locked
- Confirm Ethernet connectivity
- Intel Unite® application main splash screen is displayed
- Test video switching
- Test content sharing on the display with a laptop or other client device
- Update appropriate Asset Management Database entries

Figure 6. For each conference room type, we provide a commissioning checklist, such as the example shown here. The checklist items vary, depending on the display device installed in the room, but overall they help keep the installations consistent across the deployment—whether it happens at a single site or worldwide.

### Securely Mount the Hub

Whenever possible, we install the hub and its associated cables and network connections behind the room's display screen (see Figure 7). Doing so helps us keep the room as uncluttered as possible and helps protect the hardware. We typically use hook-and-loop fastener tape and cable ties to keep everything in place. We may also install the hub under the tabletop, if installation behind the screen is not possible.

### Proactively Manage Change

Whenever a new technology is introduced within Intel, we educate Intel employees about the change and how it will affect them.

We addressed this aspect of deployment by adopting a proactive change management strategy that helps shift employees from the old usage model to a new usage model. This strategy empowers effective local and global use and adoption by enlisting leaders, training super-users, and raising awareness and understanding for the employees. Some of the tools we used during the early stages of deployment included staff meeting visits for site management and leaders, "lunch and learn" sessions, café roadshows, site-wide communications, in-room materials, and an Intel Unite solution "community of practice" on the Intel intranet. Figure 8 shows an example of an in-room sign that we used.

### Establish Keys to a Successful Deployment

When we undertake any initiative, we define the metrics by which we can measure success. The following list that we have defined provides the keys to a successful Intel Unite solution deployment.

- Security and privacy
  - Can demonstrate that the configuration of unattended hubs meet enterprise security requirements
  - Can demonstrate compliance with privacy policy
- Remote management
  - Can use Intel AMT to control unattended hubs without having to send support staff to a conference room
  - Can use Intel AMT to remotely deploy software upgrades and configuration changes without any physical action
  - Have adequately trained frontline support analysts to solve problems remotely
- Monitoring and alerting
  - Able to monitor hubs for failure states associated with network availability, proper boot, application activity, and solid-state drives<sup>8</sup>
  - Can generate alerts and support tickets based on pre-defined failures

<sup>8</sup> The hubs in use at Intel use Intel® Solid-State Drives, which can transmit SMART (self-monitoring, analysis, and reporting technology) data to our monitoring agent.

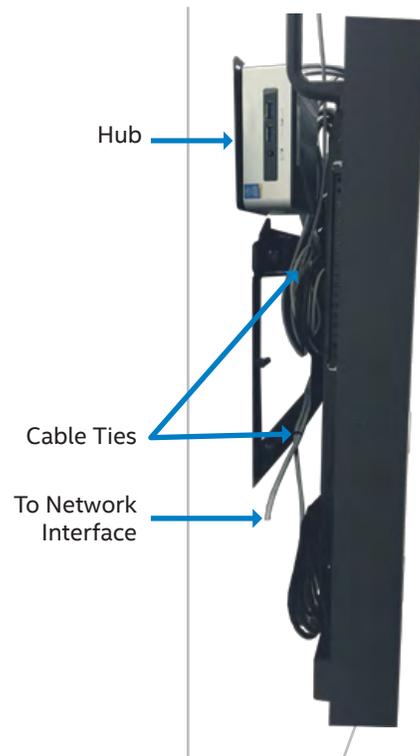


Figure 7. We mount the hub, along with its associated cables and network interface, behind the display if possible. This keeps the hub out of harm's way and keeps the room neat.



Figure 8. At the early stages of the deployment we used room signage, as shown in this example, to alert employees that the new Intel Unite® solution is available and to encourage them to use it. By providing this information, as well as a link for more information, we encourage employees to embrace change, which accelerates adoption.

## Step 4: Supporting and Maintaining the Intel Unite Solution

In order to maintain our investment in the technology and its functionality, we devote considerable time to creating the support plan.

### Implement a Sustainable Support Model

The Intel Unite solution is more than a collection of hardware, software, displays, and conference rooms. It is a service that IT offers to improve employee productivity. Therefore, we have established a service-oriented support model that addresses many aspects of the solution:

- Resource requirements for hub storage, build, and hot-swap
- Strategies for procurement, refresh, and spares
  - We plan to use a refresh cycle that is similar to the current PC client refresh cycle (two to four years)
  - We procure the first set of spares as part of initial deployment
- Roles and responsibilities for the audio/visual Service Team and the support staff who support and maintain employee client devices

Figure 9 shows the components of our service model that require specific emphasis for the Intel Unite solution.

### Use a Standard Support Process

Our support process for the Intel Unite solution is similar to the support process we use for any enterprise application:

- Employee contacts the IT Help Desk by email, phone, or chat.
- Support staff answers questions, helps troubleshoot problems, and helps escalate issues.
- For hardware problems, support staff remotely troubleshoots the hub. If required, the hub is replaced (see [Develop a Hot-Swap Strategy](#)).

In addition, we maintain a social collaboration community for the Intel Unite solution, where anyone—support staff or end users—can ask and answer questions. We also use the community to post help information, such as commonly asked questions or tips and tricks. Through this same community, users can submit feature requests. We pass those requests on to the product development group, which considers them for inclusion in the next release of the Intel Unite solution.

---

“Our user experience with Intel Unite is quite positive. Now it is very common to have more than 40 people ‘united’ in one room and have no issues. THANK YOU!”

— **Bruce Tufts**  
 VP, Logic Technology Development Group  
 Intel Corporation

---



Figure 9. People and process are required to support a global rollout and maintain a high-quality user experience. Several aspects of our support model are particularly important to the Intel Unite® solution. Note: the overall Information Technology Infrastructure Library contains many more roles.

## Develop a Hot-Swap Strategy

Although hardware failures are not common, they do happen. To minimize downtime for employees, we have developed a hot-swap strategy for replacing hubs:

- Use detailed, step-by-step scripts for build and customization processes.
- Store spare Mini PCs at the IT Service Center associated with the campus.
  - Stock two Mini PCs for sites that have an install base of 50 or fewer conference rooms that are enabled with the Intel Unite solution.
  - Stock spares equivalent to 3 to 5 percent of larger install bases.
- Mini PCs can be built with the IT client build (Windows OS plus minimum security requirements) upon receipt or when a ticket is raised.
- Patch and customize the hub to a specific room, based on the support ticket.

## Remotely Monitor and Support Hubs

When we began our first pilot deployments of the Intel Unite solution, one of our challenges was being able to monitor and report issues proactively and efficiently. Using Intel AMT, we can remotely support these systems. To expand our proactive capability, we developed a custom software agent that resides on hubs to help ensure maximum uptime and proactively alert support staff in case of a failure. (This solution is an internally developed IT solution and is not part of the Intel Unite application.)

The software agent sends a periodic “heartbeat” to a central server that monitors for them. If any of the hubs fail to report a heartbeat, the interface on the monitoring server automatically creates an alert and a support ticket. Support staff can resolve most of the issues remotely—in our experience, about 80 percent of issues encountered by hubs in rooms are detected and resolved proactively, without end-user action. If a physical action is required (such as reconnecting a power cable) the ticket is routed to the local site support team that can visit the room and resolve the issue. The location and other details of the hub are captured as part of these alerts and tickets so that the support staff knows exactly where to go.

We have found that the software agent proactively resolves issues and minimizes disruption to meetings.

## Measure Customer Usage and Adoption

To provide visibility into how employees were embracing the Intel Unite solution, we used the Intel Unite® Plugin Software Development Kit (Plugin SDK) to develop a telemetry plug-in.<sup>9</sup> This plug-in provides information about the number of connections and the length of each connection, which we can then extrapolate into usage data (see [Adoption and Usage Results](#)), which is valuable to Intel's facilities organization as well as others across the enterprise. We found that it is a simple process to use the Intel Unite Plugin SDK to develop the plug-in, which we can customize as necessary going forward.

<sup>9</sup> Telemetry is an automated communications process by which measurements are made and other data collected at remote points and transmitted to receiving equipment for monitoring.

## Intel® vPro™ Technology Helps Keep Support Costs Low

We stay at the forefront of technology by anticipating future use cases and building enterprise systems that will support those use cases as they emerge. Several years ago we foresaw the potential benefits of [Intel® vPro™ technology](#), because of its comprehensive set of security, manageability, and productivity-enhancing capabilities.<sup>10</sup> As part of Intel vPro technology, Intel® Active Management Technology (Intel® AMT) provides remote management over wired or wireless networks across devices. It enables access to clients through a secure channel irrespective of power or OS state, supports remote patching, repairing, and upgrading of operating systems and applications, and allows inventory of client-side software and hardware to be taken remotely.

Because we already had Intel AMT remote support technology in place, we could easily apply it to the Intel Unite® solution, which includes Mini PCs in many rooms with no specific person responsible for any of them (an arrangement often referred to as a “headless” system or a system including “unattended devices”). For such a solution, remote management capabilities are crucial to controlling deployment, support, and maintenance costs. For example, Intel AMT allows our Intel Help Desk staff to troubleshoot and resolve support issues by using remote keyboard/video/mouse, power management, and rebooting. Overall, Intel AMT makes managing a large deployment of the Intel Unite solution efficient and affordable.

Because Intel AMT integrates the management of unattended devices into existing management solutions, no additional training or additional management software is necessary. Intel AMT supports management of FCAPS (fault, configuration, accounting, performance, and security)<sup>11</sup> while keeping support costs low.

<sup>10</sup> For more information about use cases for Intel® vPro™ technology at Intel, see the white papers “Intel® vPro™ Technology: Proven Value in Four Use Cases” and “Achieving Long-term Business Value with Intel® vPro™ Technology.”

<sup>11</sup> FCAPS is a network management framework created by the International Organization for Standardization (ISO).

## Results

We measure the results of an initiative or deployment two ways. One measurement is purely technical—how does the solution perform? The other measurement is more qualitative—how do employees like the solution? In both respects, results from the Intel Unite solution at Intel are positive.

### Performance Testing

Our performance testing seeks to determine whether the application performance and capacity meets expectations. We also want to confirm system performance, capacity, and scalability. Table 1 lists the key elements of our testing strategy.

The results of our performance tests showed that the Intel Unite solution does not overload the servers and provides rapid responses to PIN requests:

- All transactions were successful.
- Average server CPU utilization was low: 8 percent for SQL servers and 4 percent for Web servers.
- Average transaction response time was less than .09 seconds per transaction.
- 90 percent of the PIN requests took less than .16 seconds, even during the load test.

### User Response

We have consistently received positive feedback scores from our users. We have currently deployed the solution to 3,500 rooms throughout the world and plan to reach 4,000 rooms by July 2017. We continue to measure users' acceptance and satisfaction with the Intel Unite solution and use the feedback to improve and provide the best experience possible.

#### Metrics

To rate customer satisfaction, we conducted surveys of employees who have used the Intel Unite solution. Overall, employees are excited about the way that the Intel Unite solution improves their collaboration experience. They emphasize the ease of use and the fact that it “just works.” The extensive usage and positive feedback indicate that employees value the solution. We also evaluated customer support and operations readiness.

In addition to the surveys, we used the monitoring plug-in described earlier to track the following:

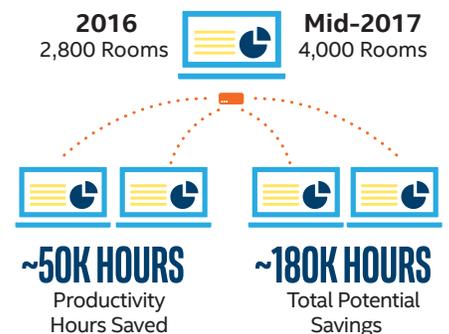
- Adoption and usage (sessions per room and hours of screen sharing per room per week)
- Stability and availability (uptime)
- Quality of service (no interruption of other services, such as disrupted VoIP calls, due to use of the Intel Unite solution)

Using this data, we have determined the Intel Unite solution saves an estimated 50,000 productivity hours per year by making meetings more efficient. When deployment is complete, we estimate a total potential savings of about 180,000 hours.

**Table 1. Testing strategy for the Intel Unite® solution**

<input type="checkbox"/>	Run a performance test against the production enterprise PIN servers. <ul style="list-style-type: none"> <li>• Run a test with 400 users requesting a PIN refresh every 5 minutes to establish baseline.</li> <li>• Run a test with 800 users requesting a PIN refresh every 2.5 minutes to load-test the application.</li> </ul>
<input type="checkbox"/>	Monitor the system resources for failed transactions.
<input type="checkbox"/>	Measure the execution time.
<input type="checkbox"/>	Monitor and measure system resource utilization.
<input type="checkbox"/>	Monitor SQL and Web servers.

### Estimated Savings Using The Intel Unite® Solution



## Adoption and Usage Results

Since 2015, we have deployed the Intel Unite solution to over 3,500 rooms. Our telemetry plug-in captures two key data points: connections and presentations. This data gives us a view into adoption and usage of the Intel Unite solution throughout all deployed rooms. Here are some data points that illustrate the popularity of the Intel Unite solution:

- Since November 2015, Intel Unite solution usage has consistently averaged at least 4.2 presentation hours per room per day. This exceeds our goal of 4 hours per day—meaning that the Intel Unite solution is in use more than 50 percent of every working day.
- Over the last 18 months the Intel Unite solution was used by employees more than 2.15 million times (connections) for 2.5 million presentations. (Multiple people connecting to the same session counts as multiple connections. Similarly, each presentation, even in the same session, is counted as separate.) During the same time period, the total duration of content-sharing approached 922,000 hours.
- We are very close to achieving our 99.5 percent goal for hub uptime; to date, we are at 99.3 percent. Our overall failure rate is a mere 2 percent, including power issues, hardware failures, and network outages.
- The metrics dashboard also captures which rooms are heavily used. Some of Intel's buildings are used around the clock, and the 10 most heavily used Intel Unite solution-capable rooms have collectively logged more than 10,000 connections—signifying healthy adoption of this technology.

## Survey Results

We have conducted several user surveys to gauge the effectiveness of the Intel Unite solution. The response has been consistently positive; the majority of users indicate they would recommend the solution to others. In both an early survey (after we had deployed the Intel Unite solution to about 500 rooms), and a survey after we had deployed to about 1,400 rooms, we garnered a consistent 83 percent satisfaction rate, far exceeding our goal of 70 percent.

## Next Steps

As we continue deployment of the Intel Unite solution, we plan to continue collecting monthly metrics that document usage, deployment, and user stories. Our goal is to complete Intel Unite solution deployment to 4,000 conference rooms by July 2017, as well as introduce enhanced capabilities that will further support collaboration and innovation across Intel. These capabilities include PIN-less join as well as integration with Unified Communications software that will support audio, video, and content-sharing between Intel Unite sessions and the Unified Communications platform. We also anticipate further integrating digital whiteboards, touch screens, room lighting control, room occupancy detection, and other sensor-based capabilities.



## 2015 Early Adopter Comments About the Intel Unite® Solution

- "It is easy to use and very responsive."
- "I love that I didn't need a dongle."
- "Love the ease; not having to wrestle with cables and buttons."
- "Quick and easy swapping of who is sharing, easy to share."
- "It works!"
- "No more dongles!"
- "Utter simplicity"

## Recent Survey Comments About the Intel Unite® Solution

- "Unite is great and makes meetings/sharing content very efficient."
- "Projecting content wirelessly is extremely convenient!"
- "Ease of use. Instantly working."
- "It's fast. It's easy. It works."
- "Amazing. It's needed in all conference rooms."
- "I love not having to carry around a dongle to meetings."

The Intel Unite solution is now standard in any new or retrofitted collaboration space at Intel, including those from merger and acquisition activity. We continue to work closely with Intel IT planning and architecture groups, as well as the Intel product group that provides the Intel Unite solution.

## Conclusion

Today's business world needs smarter meeting spaces—conference rooms that connect the entire workforce from any location, seamlessly and wirelessly. At Intel, the Intel Unite solution is powering modern, connected, and secure meeting spaces that boost our employee's collaboration and productivity.

Intel IT has successfully deployed and now manages thousands of conference rooms with the Intel Unite solution. We have streamlined management of these rooms by using Intel vPro technology, which enables us to remotely manage, update, and repair all hubs, whether they are turned on or off.

Based on the positive feedback we have received from employees who have used the solution, we are expanding the concept of a "PC in every room" to enhance meeting rooms—and the collaboration experience—by making the Intel Unite solution a standard component of any new or renovated Intel facility. We are sharing our best practices for preparing for, deploying, and supporting the Intel Unite solution to enable other enterprises to more easily bring this solution into their own environments.

For more information on Intel IT best practices, visit [intel.com/IT](https://intel.com/IT).

Receive objective and personalized advice from unbiased professionals at [advisors.intel.com](https://advisors.intel.com). Fill out a simple form and one of our experienced experts will contact you within 5 business days.

### IT@Intel

We connect IT professionals with their IT peers inside Intel. Our IT department solves some of today's most demanding and complex technology issues, and we want to share these lessons directly with our fellow IT professionals in an open peer-to-peer forum.

Our goal is simple: improve efficiency throughout the organization and enhance the business value of IT investments.

Follow us and join the conversation:

- [Twitter](#)
- [#IntelIT](#)
- [LinkedIn](#)
- [IT Center Community](#)

Visit us today at [intel.com/IT](https://intel.com/IT) or contact your local Intel representative if you would like to learn more.

### Related Content

If you liked this paper, you may also be interested in these related stories:

- [Conference Room Collaboration Using Intel® vPro™ Technology paper](#)
- [Wireless Infrastructure Implementation: Best Practices paper](#)



Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. Check with your system manufacturer or retailer or learn more at [intel.com](https://intel.com).

Cost reduction scenarios described are intended as examples of how a given Intel- based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

THE INFORMATION PROVIDED IN THIS PAPER IS INTENDED TO BE GENERAL IN NATURE AND IS NOT SPECIFIC GUIDANCE. RECOMMENDATIONS (INCLUDING POTENTIAL COST SAVINGS) ARE BASED UPON INTEL'S EXPERIENCE AND ARE ESTIMATES ONLY. INTEL DOES NOT GUARANTEE OR WARRANT OTHERS WILL OBTAIN SIMILAR RESULTS.

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL PRODUCTS AND SERVICES. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS AND SERVICES INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

Intel, the Intel logo, Intel Core, Intel Unite, Intel vPro, and Ultrabook are trademarks of Intel Corporation in the U.S. and other countries.

\*Other names and brands may be claimed as the property of others. Copyright © 2017 Intel Corporation. All rights reserved.

Printed in USA

Please Recycle

0517/JJLU/KC/PDF