

# A BETTER PRESENTATION EXPERIENCE WITH INTEL PRO WIDI

## Share your ideas seamlessly with Intel® Pro WiDi

### Simpler setup

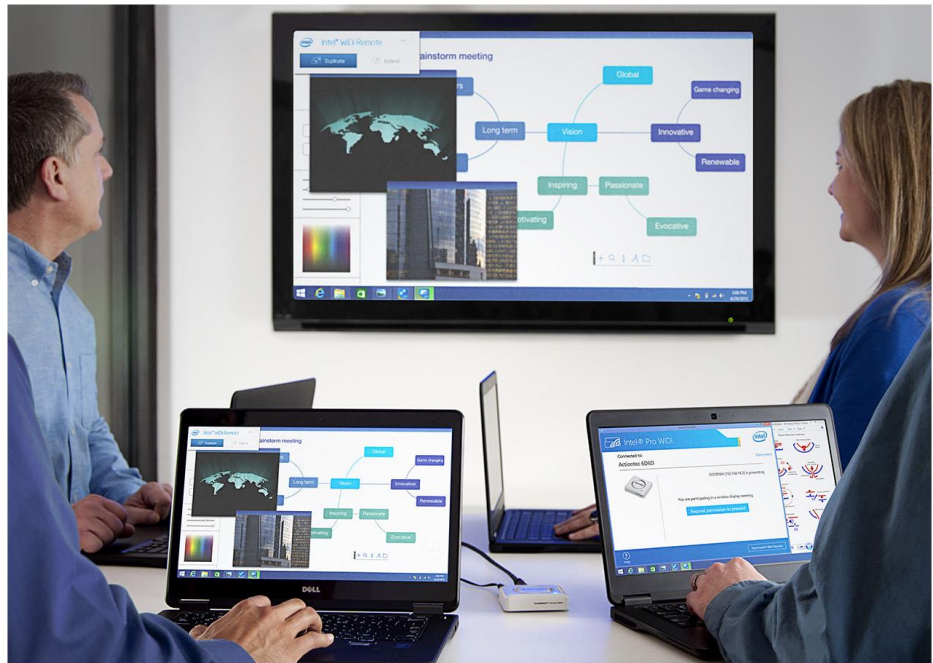
Connecting was easy and taking turns required only a few clicks—no cables needed

### More private & secure

Users share only what they intend to, with no need to use your company's wireless network

### Less waiting

Cut connection time by up to one-third



Using Intel Pro WiDi-enabled Dell™ Latitude™ E7450 Ultrabooks™ and Actiontec® ScreenBeam® Pro Business Edition compared to connecting via HDMI

Intel Pro Wireless Display (WiDi) is a new connection technology with the potential to improve the business meeting process. Available on all Dell Latitude systems that include Intel vPro processors, WiDi offers three management options to minimize disruptions and enhance collaboration. It also has security and privacy advantages over other ways of connecting and is easily configured to reduce IT workload.

Here at Principled Technologies, we compared the experience of connecting a Dell Latitude Ultrabook system featuring the new 5th Generation Intel Core processor to an HD display two ways: first with HDMI cables and then using the wireless connections available with Intel Pro WiDi. We found that not only was the Intel Pro WiDi approach extremely convenient and easy to use, it also connected more quickly than the cable option.

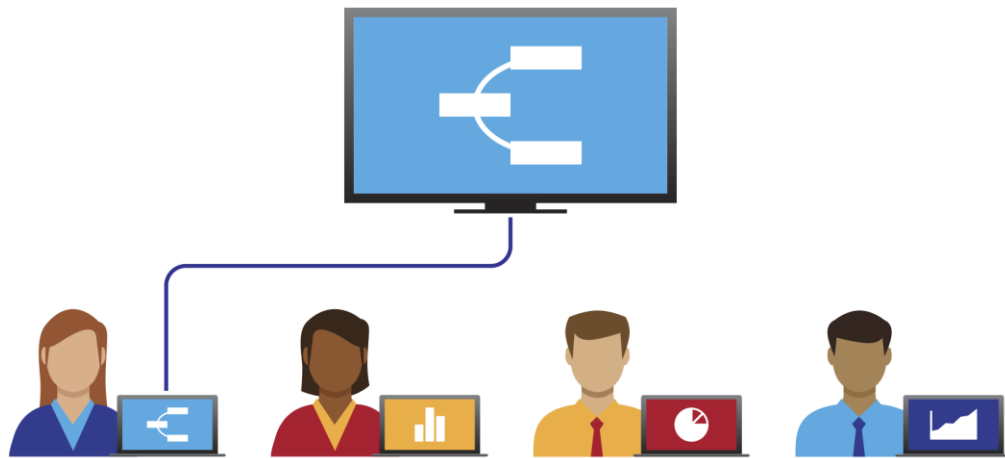
Consider Intel Pro WiDi technology to help your meetings keep moving and give each of your big ideas the attention they deserve.



# INTEL WIRELESS TECHNOLOGY—THE CONVENIENCE OF A WIRELESS CONNECTION WITH NONE OF THE DRAWBACKS

## Connecting with cables

For years, using a cable to connect your laptop to an external display was standard operating procedure for presenting material to a group. As long as the person presenting remembered to bring her cable, made sure it was the correct type, and avoided tripping over it, all was well. If her colleague had something to show the group, she unplugged and everyone waited while he used her cable, or his own, to connect his laptop to the display.



**Figure 1: Before the advent of wireless technology, presenters would take turns connecting their laptops to the display using HDMI cables.**

## Intel Pro WiDi security advantages

As wireless networks within companies became prevalent, eschewing the cable became an option—the presenter needed only the proper credentials to join the network. Not having to keep track of cables simplified the process, but giving a guest presenter access to the corporate wireless network could introduce a security risk. Their laptop could become a “soft access point” back door for malware through unsecure peer-to-peer connections.

Designed to give users a better experience in conference rooms and in meetings, Intel wireless technology delivers all the advantages of connecting to projectors and displays through a wireless network, without the security risk incurred by granting access to an infrastructure Wi-Fi network.

It accomplishes this by taking advantage of the Intel Pro WiDi ability to connect to two separate radio channels, one for Wi-Fi networking, and a second one that connects directly to an Intel Pro WiDi receiver attached to the display. In our testing, we

used the Actiontec ScreenBeam Pro Business Edition display receiver. This allows employees to access both the WiDi receiver and the corporate network, while allowing you to grant a guest who has a laptop with Intel WiDi Pro technology access to only the WiDi receiver.

## Intel Pro WiDi privacy advantages

Sometimes it's important to keep certain data from reaching a display. This could be sensitive business information that you don't want guests from outside the company to see or a personal message you'd like to keep private.

Because Intel Pro WiDi requires users to verify their connection to a display with PIN prior to displaying content for the first time, it can help you avoid inadvertently projecting to the incorrect display or conference room. The Intel WiDi Remote's Extend Mode gives the user an easy way to select which open application to display on the projector in full-screen mode to protect sensitive or private information—it presents a list of open applications, any of which the user can send to the presentation display with a single click. This means that you won't accidentally project your email or chat session.

## Intel Pro WiDi presentation modes

Intel Pro WiDi offers three presentation modes that give presenters flexibility and help with meeting management. Each mode is suited to a different meeting structure:

- **Exclusive Mode** gives a single presenter uninterrupted control of the display.
- **Moderated Mode** allows one person to control who will use the display at any given point in a meeting.
- **Interactive Mode** lets control pass amongst attendees.

Selecting the correct mode helps ensure that the meeting flows smoothly.

## ABOUT OUR TESTING

In addition to its advantages in the areas of security, privacy, and flexibility, using Intel Pro WiDi for your presentation needs can also save time. We put this to the test in our labs. We used four Dell Latitude E7450 Ultrabook laptops, all powered by the Intel Core i5-5300U processor, a 5th Generation Intel Core vPro processor featuring Intel Pro WiDi technology. One of our laptops ran the Microsoft Windows 7 operating system and the others ran Windows 8.1.

We created three test scenarios, each using a different Intel Pro WiDi presentation mode. For all three scenarios, we first made presentations using WiDi technology to connect wirelessly to the ScreenBeam Pro and noted how easily and quickly we could work. Then we made the same presentations the old-fashioned way, with HDMI cables, to see how the two compared. We carried out the scenarios multiple

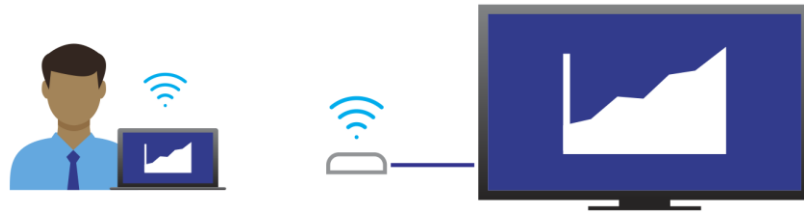
times to represent users connecting to the display for multiple, sequential meetings. We report median times in our results.

For detailed configuration information of the test systems, see [Appendix A](#). For detailed steps on how we tested, see [Appendix B](#).

## WHAT WE FOUND

### Exclusive Mode

Brian has a series of meetings to present regional sales numbers to a group of VPs. He uses his Ultrabook powered by a 5th Generation Intel Core vPro processor to connect to the HD display. Because he is the only presenter, he uses Exclusive Mode when connecting wirelessly (see Figure 2). Exclusive Mode locks Intel Pro WiDi into a one-to-one connection with a single user, preventing other users from taking over the session until the current presenter ends the session. Note: We tested this scenario with both the Windows 7 Ultrabook and the Windows 8.1 Ultrabook.



**Figure 2: Brian is the only person presenting at this meeting, so he uses Exclusive Mode.**

The initial connection with Intel Pro WiDi requires driver configuration and setup. Once this setup is complete, subsequent requests are quick and simple. All that is required on Windows 8.1 is to swipe in the Charms bar, and select the desired WiDi receiver from the Project charm. Windows 7-based users use the WiDi control application to select a previously configured receiver. No further configuration is required.

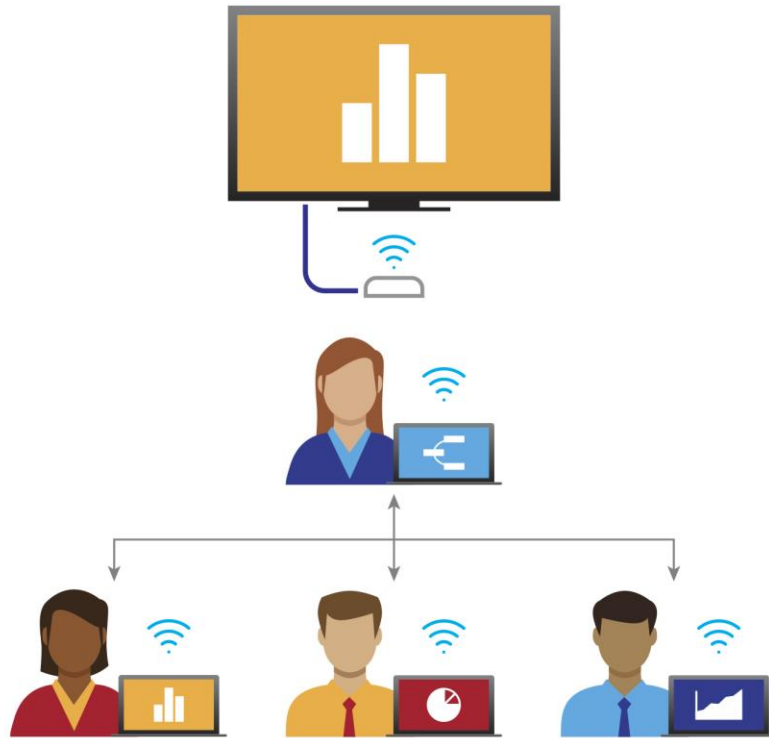
Figure 3 shows how long the Windows 7 Ultrabook and the Windows 8.1 Ultrabook took to connect after we had completed that initial setup. We report the time needed for one presenter to connect one time. As it shows, on both systems, using Intel Pro WiDi reduced the time to connect by more than one-fourth compared to using the HDMI cable.

|                       | HDMI cable | Intel Pro WiDi wireless | Time saved | Percentage improvement |
|-----------------------|------------|-------------------------|------------|------------------------|
| Windows 7 Ultrabook   | 36.2       | 26.5                    | 9.7        | 26.7%                  |
| Windows 8.1 Ultrabook | 42.8       | 31.5                    | 11.3       | 26.4%                  |

**Figure 3: Time in seconds to for one presenter to connect to a display and present an application in Exclusive Mode one time (after completing initial setup). Except for time saved and percentage improvement, lower numbers are better.**

## Moderated Mode

Frances leads her social media team in weekly meetings reviewing trends and stats. She uses her Ultrabook powered by a 5th Generation Intel Core vPro processor to connect to the HD display. Frances serves as the main presenter and host, allowing team members to share documents on the HD display when appropriate (see Figure 4). In this mode, Frances acts as a gatekeeper, using the Intel Pro Wireless controls to select from a list of connected users who will present on the conference display with a single click. Once she selects a new presenter, she clicks “Accept” and his content appears on screen.



**Figure 4: Frances lets the other members of her team have turns presenting material at their meeting, so she uses Moderated Mode.**

As we mentioned earlier, the initial connection with Intel Pro WiDi requires driver configuration and setup. Figure 5 shows how long the Windows 7 and Windows 8.1 Ultrabooks took to connect after we had completed that initial setup. We report the total time needed for four presenters to connect one time each. On both systems, using Intel Pro WiDi reduced the time to connect by more than one-tenth compared to using the HDMI cable.

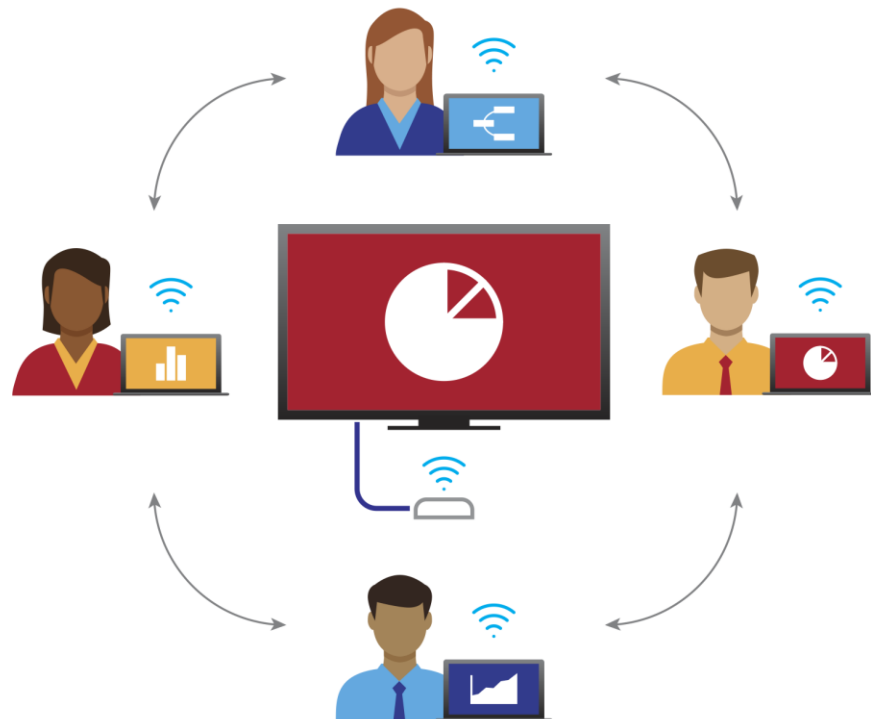
|   | HDMI cable | Intel Pro WiDi wireless | Time saved | Percentage improvement |
|---|------------|-------------------------|------------|------------------------|
| Windows 7 Ultrabook and Windows 8.1 Ultrabook | 1:12.8     | 1:04.4                  | 08.4       | 11.6%                  |

**Figure 5: Total time in minutes and seconds for four users to connect to a display and present an application in Moderated Mode one time (after completing initial setup). Except for time saved and percentage improvement, lower numbers are better.**

## Interactive Mode

Jamal is part of a four-person leadership team that meets regularly to discuss budgeting. He uses his Ultrabook powered by a 5th Generation Intel Core vPro processor to connect to the HD display. The team meets in one of the company conference rooms and each member contributes to the presentation equally.

Interactive Mode is conducive to rapid iteration and brainstorming. There is no gatekeeper in this mode, which allows for dynamic changing from one presenter to the next as an idea comes up. All users connect as usual to the session that the organizer creates. The person who wishes to share content next selects “Request to Present” on the Intel control application, and a small confirmation button appears in the corner of the current presenter’s primary display. Once the current presenter clicks to accept the request, control instantly transfers to the new presenter. Figure 6 illustrates Interactive Mode.



**Figure 6: Jamal and his colleagues take turns presenting their budgets to each other at their meeting, so they use Interactive Mode.**

Jamal begins by presenting his data. As he does so, his colleague Natalie recognizes an issue that she recently resolved, and selects “Request to Present.” Once Jamal finishes his thought, he accepts Natalie’s request, giving her access to the screen. After she has shared her data, she asks who’d like to present next. Kevin says that he’s ready, and selects “Request to Present.” Natalie accepts and Kevin controls the screen. After a few minutes, Jamal has a piece of data he think would help Kevin, so he makes a request to present and Kevin accepts it. They proceed in this fashion for the remainder of their meeting.

As with the other modes, the initial connection with Intel Pro WiDi requires driver configuration and setup. Figure 7 shows how long the Windows 7 and Windows 8.1 Ultrabooks took to connect after we had completed that initial setup. We report the total time needed for four presenters to connect two times each. On both systems, using Intel Pro WiDi reduced the time to connect by more than one-third—saving 1 minute and 18 seconds--compared to using the HDMI cable. This could speed up their meeting noticeably, letting them spend less time switching cables, moving around the conference room, or waiting and more time collaborating.

|   | HDMI cable | Intel Pro WiDi wireless | Time saved | Percentage improvement |
|---|------------|-------------------------|------------|------------------------|
| Windows 7 Ultrabook and Windows 8.1 Ultrabook | 3:20.6     | 02:01.6                 | 1:19.0     | 39.4%                  |

**Figure 7: Total time in minutes and seconds for four users to connect to a display and present an application in Interactive Mode two times (after completing initial setup. Except for time saved and percentage improvement, lower numbers are better.**

## CONCLUSION

New technology can foster collaborative environments and save time in your meetings and presentations. We found that Dell Latitude E7450 Ultrabook systems powered by 5th Generation Intel Core vPro processors with Intel Pro WiDi technology saved time when connecting and displaying applications in Exclusive, Moderated, and Interactive scenarios compared to connecting the devices using HDMI cables. It also offered privacy and security advantages over other ways of connecting to display devices. Keep the meeting moving and give your big ideas the attention they deserve with Intel Pro WiDi.

## APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 8 provides detailed configuration information for the test systems.

| System                                      | Dell Latitude E7450: Windows 7      | Dell Latitude E7450: Windows 8.1    |
|---|-------------------------------------|-------------------------------------|
| <b>General</b>                              |                                     |                                     |
| Number of processor packages                | 1                                   | 1                                   |
| Number of cores per processor               | 2                                   | 2                                   |
| Number of hardware threads per core         | 2                                   | 2                                   |
| Total number of processor threads in system | 4                                   | 4                                   |
| System power management policy              | Dell                                | Dell                                |
| Processor power-saving option               | Enhanced Intel SpeedStep Technology | Enhanced Intel SpeedStep Technology |
| System dimensions (length x width x height) | 13.3" x 9.12" x 0.8"                | 13.3" x 9.12" x 0.8"                |
| System weight (lbs.)                        | 3.43                                | 3.43                                |
| <b>CPU</b>                                  |                                     |                                     |
| Vendor                                      | Intel                               | Intel                               |
| Name  | Core i5                             | Core i7                             |
| Model number                                | 5300U                               | 5600U                               |
| Stepping                                    | F0                                  | F0                                  |
| Socket type and number of pins              | Socket 1168 BGA                     | Socket 1168 BGA                     |
| Core frequency (GHz)                        | 2.3                                 | 2.6                                 |
| L1 cache                                    | 2 x 32 KB + 2 x 32 KB               | 2 x 32 KB + 2 x 32 KB               |
| L2 cache                                    | 2 x 256 KB                          | 2 x 256 KB                          |
| L3 cache                                    | 3 MB                                | 3 MB                                |
| <b>Platform</b>                             |                                     |                                     |
| Vendor                                      | Dell                                | Dell                                |
| Motherboard model number                    | 0D8H72                              | 0YGN55                              |
| Motherboard chipset                         | Broadwell-U                         | Broadwell-U                         |
| BIOS name and version                       | Dell A00 (10/24/2014)               | Dell A00 (10/24/2014)               |
| <b>Memory module(s)</b>                     |                                     |                                     |
| Vendor and model number                     | Hyundai HMT451S6AFR8A-PB            | Samsung M471B1G73QH0-YK0            |
| Type  | PC3-12800                           | PC3-12800                           |
| Speed (MHz)                                 | 800                                 | 800                                 |
| Speed running in the system (MHz)           | 800                                 | 800                                 |
| Timing/Latency (tCL-tRCD-tRP-tRASmin)       | 11-11-11-28                         | 11-11-11-28                         |
| Size (MB)                                   | 4,096                               | 8,192                               |
| Number of memory module(s)                  | 1                                   | 1                                   |
| Total amount of system RAM (GB)             | 4                                   | 8                                   |
| Channel (single/dual)                       | Single                              | Single                              |



| System                               | Dell Latitude E7450: Windows 7                    | Dell Latitude E7450: Windows 8.1                  |
|--------------------------------------|---|---|
| <b>Hard disk</b>                     |   |   |
| Vendor and model number              | Samsung PM851                                     | Samsung PM851                                     |
| Number of disks in system            | 1   | 1   |
| Size (GB)                            | 128   | 256   |
| Buffer size (MB)                     | NA  | NA  |
| RPM                                  | NA  | NA  |
| Type                                 | SATA 6.0 Gb/s                                     | SATA 6.0 Gb/s                                     |
| Controller                           | Intel Mobile Express Chipset SATA RAID Controller | Intel Mobile Express Chipset SATA RAID Controller |
| Driver                               | Intel 13.2.0.1016 (06/20/2014)                    | Intel 13.2.0.1016 (06/20/2014)                    |
| <b>Operating system</b>              |   |   |
| Name                                 | Windows 7   | Windows 8.1                                       |
| Build number                         | 7601  | 9600  |
| File system                          | NTFS  | NTFS  |
| Kernel                               | ACPI x64-based PC                                 | ACPI x64-based PC                                 |
| Language                             | English   | English   |
| Microsoft DirectX version            | DirectX 11  | DirectX 11  |
| <b>Graphics</b>                      |   |   |
| Vendor and model number              | Intel HD Graphics 5500                            | Intel HD Graphics 5500                            |
| Type                                 | Integrated  | Integrated  |
| Chipset                              | Intel HD Graphics Family                          | Intel HD Graphics Family                          |
| BIOS version                         | 1032v15   | 1032v15   |
| Total available graphics memory (MB) | 1,661   | 3,839   |
| Dedicated video memory (MB)          | 64  | 64  |
| System video memory (MB)             | 0   | 0   |
| Shared system memory (MB)            | 1,597   | 3,839   |
| Resolution                           | 1366 x 768  | 1920 x 1080                                       |
| Driver                               | Intel 10.18.14.4099 (01/19/2015)                  | Intel 10.18.14.4099 (01/19/2015)                  |

Figure 8: Configuration information for the test systems.

## APPENDIX B – HOW WE TESTED

### Exclusive Mode

#### Connecting and displaying an application with Intel Pro WiDi on a Windows 8.1 laptop

1. Simultaneously start a timer and swipe in the Charms bar, and then choose Devices→Project→Add a Wireless Display.
2. Select the Actiontec receiver from the list.
3. When prompted, enter the PIN from the conference display.
4. Wait for the wizard to complete the driver installation.
5. On the Intel® Pro WiDi Screen confirmation page, select Only I present, and then click Yes – start sharing.
6. In the Intel Pro WiDi control application, click Open Intel WiDi Remote.
7. In the Intel WiDi Remote, select Extend.
8. To verify Different Channel Mode connectivity, open an application from the network via Wi-Fi.
9. Select the document in the Intel WiDi remote so that it appears on the conference display, and then stop the timer.

#### Connecting and displaying an application with Intel Pro WiDi on a Windows 7 laptop

1. Simultaneously start a timer and open the Intel WiDi control application.
2. Select the Actiontec receiver from the list.
3. When prompted, enter the PIN from the conference display.
4. Wait for the wizard to complete the driver installation.
5. On the Intel® Pro WiDi Screen confirmation page, select Only I present, and then click Yes – start sharing.
6. In the Intel Pro WiDi control application, click Open Intel WiDi Remote.
7. In the Intel WiDi Remote, select Extend.
8. To verify Different Channel Mode connectivity, open an application from the network via Wi-Fi.
9. Select the document in the Intel WiDi remote so that it appears on the conference display, and then stop the timer.

#### Connecting and displaying an application with an HDMI physical connection from a Windows 8.1 laptop

1. Simultaneously start a timer and connect the laptop to the conference display via HDMI. By default, conference display may connect as an extended display.
2. If the display starts in mirrored mode, open the Display Properties panel, and configure the conference display as extended.
3. Open an application from the network via Wi-Fi.
4. Drag the document to the conference display, and then stop the timer.

#### Connecting and displaying an application with an HDMI physical connection from a Windows 7 laptop

1. Simultaneously start a timer and connect the laptop to the conference display via HDMI.
2. Open the Display Properties control panel, and configure the conference display as extended.
3. Open an application from the network via Wi-Fi.
4. Drag the document to the conference display, and then stop the timer.

## Moderated Mode

### Connecting and displaying documents with Intel Pro WiDi on Windows 7 and Windows 8.1 laptops

1. Simultaneously start the timer and on the Host laptop, select I can request others to present.
2. On three other laptops, join using the steps listed in Exclusive mode. A PIN will be displayed for each person who joins on the conference display.
3. On the host laptop, select a guest laptop, and request the guest to present.
4. On the guest laptop, extend the desktop, and present an application as listed above.
5. Repeat steps 3 and 4 for the other two guest laptops.
6. Stop the timer.
7. Record the total elapsed time to present all three guests.

### Connecting and displaying documents with an HDMI physical connection from Windows 8.1 laptops

1. Simultaneously start a timer and disconnect the host laptop.
2. Connect the first Windows 8.1 guest laptop to the conference display via HDMI. By default, conference display should connect as an extended display.
3. Open an application from the network via Wi-Fi.
4. Drag the document to the conference display.
5. Disconnect the laptop, and repeat steps 2 through 5 for the remaining Windows 8.1 laptop.

### Connecting and displaying documents with an HDMI physical connection from Windows 7 laptops

1. Disconnect the Windows 8.1 laptop.
2. Connect the guest Windows 7 laptop to the conference display via HDMI.
3. Open the Display Properties control panel, and configure the conference display as extended.
4. Open an application from the network via Wi-Fi.
5. Drag the document to the conference display.
6. Stop the timer.
7. Record the total time of the physical connection section.

## Interactive Mode

### Connecting and displaying documents with Intel Pro WiDi on Windows 7 and Windows 8.1 laptops

1. Simultaneously start a timer and on the Host laptop, select Others can request to present.
2. On three other laptops, join using the steps listed in Exclusive mode.
3. On the host laptop, extend the desktop and present an application as listed above.
4. On the first guest laptop, request to present.
5. Extend the desktop, and present an application as listed above.
6. Repeat steps 3 through 5 for the other two guest laptops.
7. For two presentations per laptop, complete an additional cycle of testing (steps 1 through 6).
8. Stop the timer.
9. Record the total elapsed time to present all four laptops twice.

### **Connecting and displaying documents with an HDMI physical connection from Windows 8.1 laptops**

1. Simultaneously start the timer and connect the host laptop to the conference display via HDMI. By default, conference display should connect as an extended display.
2. Open an application from the network via Wi-Fi.
3. Drag the document to the conference display.
4. Disconnect the host laptop.
5. Connect the first Windows 8.1 guest laptop to the conference display via HDMI.
6. Repeat steps 2 to 4 for the guest laptop.
7. Disconnect the laptop, and repeat steps 2 through 5 for the remaining Windows 8.1 laptop.

### **Connecting and displaying documents with an HDMI physical connection from Windows 7 laptops**

1. Disconnect the Windows 8.1 laptop.
2. Connect the guest Windows 7 laptop to the conference display via HDMI.
3. Open the Display Properties control panel, and configure the conference display as extended, if necessary.
4. Open an application from the network via Wi-Fi.
5. Drag the document to the conference display.
6. Starting with the host laptop, repeat the cycle of testing (steps 1 through 5).
7. Stop the timer after completing two full cycles (each laptop presents twice).
8. Record the total time for two full cycles of rotation.

## ABOUT PRINCIPLED TECHNOLOGIES



Principled Technologies, Inc.  
1007 Slater Road, Suite 300  
Durham, NC, 27703  
[www.principledtechnologies.com](http://www.principledtechnologies.com)

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.

---

Principled Technologies is a registered trademark of Principled Technologies, Inc.  
All other product names are the trademarks of their respective owners.

---

**Disclaimer of Warranties; Limitation of Liability:**

PRINCIPLED TECHNOLOGIES, INC. HAS MADE REASONABLE EFFORTS TO ENSURE THE ACCURACY AND VALIDITY OF ITS TESTING, HOWEVER, PRINCIPLED TECHNOLOGIES, INC. SPECIFICALLY DISCLAIMS ANY WARRANTY, EXPRESSED OR IMPLIED, RELATING TO THE TEST RESULTS AND ANALYSIS, THEIR ACCURACY, COMPLETENESS OR QUALITY, INCLUDING ANY IMPLIED WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE. ALL PERSONS OR ENTITIES RELYING ON THE RESULTS OF ANY TESTING DO SO AT THEIR OWN RISK, AND AGREE THAT PRINCIPLED TECHNOLOGIES, INC., ITS EMPLOYEES AND ITS SUBCONTRACTORS SHALL HAVE NO LIABILITY WHATSOEVER FROM ANY CLAIM OF LOSS OR DAMAGE ON ACCOUNT OF ANY ALLEGED ERROR OR DEFECT IN ANY TESTING PROCEDURE OR RESULT.

IN NO EVENT SHALL PRINCIPLED TECHNOLOGIES, INC. BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH ITS TESTING, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL PRINCIPLED TECHNOLOGIES, INC.'S LIABILITY, INCLUDING FOR DIRECT DAMAGES, EXCEED THE AMOUNTS PAID IN CONNECTION WITH PRINCIPLED TECHNOLOGIES, INC.'S TESTING. CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES ARE AS SET FORTH HEREIN.

---