



**Screen Sharing Performance
of Web Conferencing Services**

Competitive Analysis

Prepared for Adobe Systems

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Table of Contents

Introduction	1
The Next Generation of Web Conferencing	1
Delivering a Quality Experience through Screen Sharing	1
Latency	1
Smoothness	1
Fidelity	2
Bandwidth	2
Adobe Acrobat Connect Professional: A Better Screen Sharing Experience for Users and IT	3
Minimal Latency, Maximum Smoothness, and True Fidelity with Adobe Acrobat Connect Professional	3
Efficient Bandwidth Consumption with Adobe Acrobat Connect Professional.....	5
Conclusion	5
Exhibit A: Screen Sharing Testing Methodology	6
Exhibit B: Configuring Adobe Acrobat Connect Professional	8
Exhibit C: What's New: Improved Performance with Adobe Acrobat Connect Professional	9

Introduction

As web conferencing becomes increasingly prevalent, users are seeking more sophisticated experiences. Critical to a successful web conferencing experience is the ability of the presenter to share rich content on their screen with meeting attendees. With new Turbo Screen Sharing™ capabilities, Adobe® Acrobat® Connect™ Professional's screen sharing capabilities outperform the industry. Adobe Acrobat Connect Professional offers users the ability to have a more productive and engaging web conferencing experience while providing the IT department with a program that efficiently utilizes bandwidth and minimally impacts the infrastructure.

The Next Generation of Web Conferencing

The popularity of web conferencing has been fueled by a desire to increase productivity by easing communications among workers with a way to meet instantly and cost-effectively. While the distributed workforce has never been farther apart geographically, we are now “virtually” closer together than ever. As popularity increases, web conferencing users are demanding more sophisticated experiences, seeking to emulate real-world productivity in this modern, online space.

Collaboration in web conferencing is common through screen sharing, where a conference leader displays the content of their computer screen to the other meeting attendees. The conference leader can show his or her desktop, sharing information with attendees such as important documents, websites, or other items of interest. Beyond basic documents, rich content such as video and graphically intense presentations, is increasingly shared to help keep web conferencing users engaged and help provide an added dimension to the online conferencing experience.

While rich content increases and improves the web conferencing experience for users, the data intensive nature of rich content can strain hardware infrastructure and push bandwidth capabilities to their limits. The next generation of web conferencing requires a rich user experience that can be supported by a technology infrastructure that works.

Delivering a Quality Experience through Screen Sharing

A quality experience for web conferencing users is one that maximizes the ability of the presenter to deliver a seamless experience to web conferencing attendees. Specifically, it enables the presenter to provide a web conferencing experience with minimal latency, maximum smoothness, and true fidelity, all while efficiently managing bandwidth.

Latency

Latency is the time delay between the moment something is initiated, and the moment one of its effects begins or becomes detectable. In web conferencing screen sharing, it is the delay between when the presenter initiates an activity, such as through a mouse click or a cursor move on their screen, and when an attendee observes the same action on their computer locally. Shorter latency means less lag time between the presenter and the attendee resulting in a more real-time experience. This also means the attendee is less likely to get lost in an interaction and that all participants can literally be “on the same page” at the same time.

Smoothness

A smooth experience is one that flows easily with a minimum of choppiness. In screen sharing, what underlies a smooth experience is often a high frame rate, where the screen is able to produce a high number of unique consecutive images (frames) on a per second basis. A high frame rate means that the experience of seeing a video or graphically rich presentation via web conferencing is more similar to watching television, where video and audio are synchronized,

where images are clear, and where the experience flows. A smooth experience has a higher quality feel to it, and it allows the web conferencing attendees to focus on the message or content the presenter is delivering, rather than be distracted by obvious technology glitches or imperfections.

Fidelity

Fidelity denotes how accurate a copy is to its source. When screen sharing, a presentation with perfect fidelity looks identical to both the presenter and attendee. Fidelity is important because the more similar the presentations are, the higher likelihood there is of the presenter being able to clearly get across his visual message, reducing the risk that the attendees misread or misinterpret something in the web conferencing room. When graphics, shapes, and colors, are truer and more consistent, the web conferencing experience is improved.

Bandwidth

Bandwidth consumption is not readily apparent to the web conferencing user but the effects of inefficient bandwidth utilization can often be clearly seen in the web conferencing room. A web conferencing system that is able to deliver a high-quality experience – delivering minimal latency, maximum smoothness, and true fidelity – while utilizing less bandwidth means a more consistently positive experience for all users. Users in low bandwidth settings – those in branch offices, working from home, traveling on the road – can still have a very high-quality experience if bandwidth utilization is efficient with the web conferencing service. Additionally, when corporate networks are congested, efficient use of bandwidth allows for a better experience for users, with less impact on the network for IT.

Adobe Acrobat Connect Professional: A Better Screen Sharing Experience for Users and IT

With Adobe Acrobat Connect Professional's new Turbo Screen Sharing capabilities, screen sharing users can expect to see minimal latency, maximum smoothness, and true fidelity, with very efficient bandwidth consumption. In tests that compared Adobe Acrobat Connect Professional to the industry average, Adobe Acrobat Connect Professional screen sharing consistently outperformed, offering users the ability to have a high-quality web conferencing experience while minimizing the impact on IT.

The performance test materials included a graphically intense PowerPoint file and a fast moving video being streamed from a website. The industry average or standard is defined as the mean of the performance of WebEx Meeting Center™, Microsoft® Live Meeting, Citrix® GoToMeeting®, and Yugma™, using the metrics outlined below. Adobe Acrobat Connect Professional SP3 was tested.

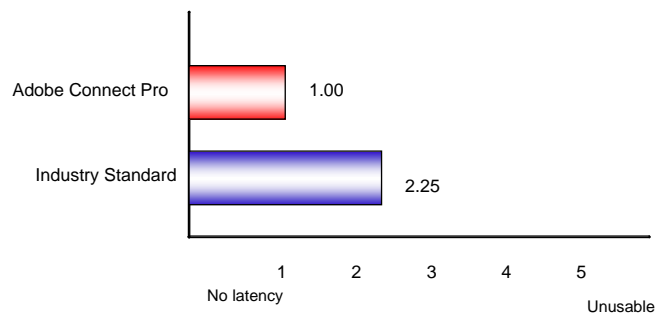
Minimal Latency, Maximum Smoothness, and True Fidelity with Adobe Acrobat Connect Professional's Turbo Screen Sharing Capabilities

Adobe Acrobat Connect Professional offers a superior web conferencing experience with screen sharing abilities that exceed the industry average in all areas – minimizing latency, maximizing smoothness, and providing true fidelity.

Minimal Latency

Adobe Acrobat Connect Professional has no discernable latency between the time the content was presented and the screen share image was received and it outperformed the industry standard:

Latency Comparison:



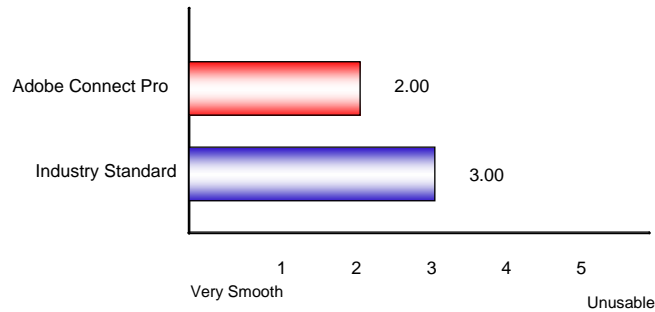
Latency Scale:

- 1 = no latency (between 0s and 0.5s)
- 2 = little latency (between 0.5s and 1.5s)
- 3 = some latency (between 1.5s and 5s)
- 4 = high latency (above 5s)
- 5 = unusable (above 20s)

Maximum Smoothness

Adobe Acrobat Connect Professional has smoother performance than the industry standard, allowing for a screen sharing experience that flows better, with less choppiness:

Smoothness Comparison:



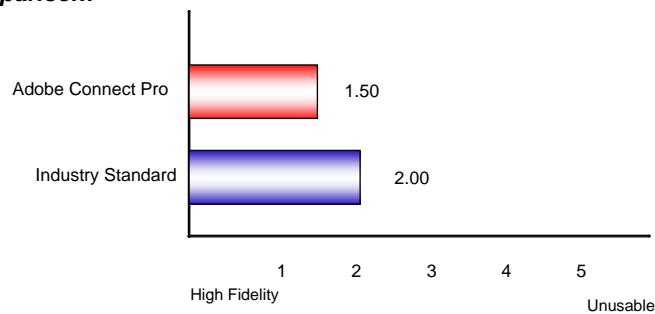
Smoothness Scale:

- 1 = very smooth
- 2 = smooth
- 3 = choppy
- 4 = very choppy
- 5 = unusable

True Fidelity

Adobe Acrobat Connect Professional has fidelity that is superior to the industry standard, demonstrating colors and gradients that are truer to the original source material being shared:

Fidelity Comparison:



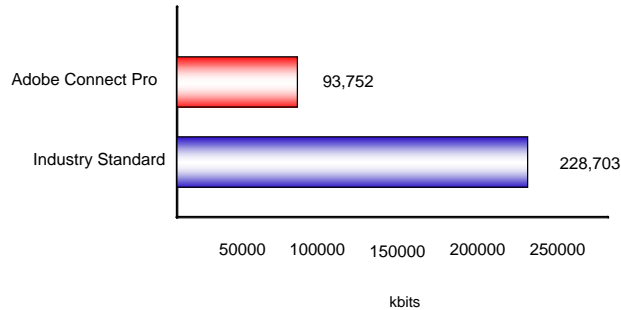
Fidelity Scale:

- 1 = high fidelity
- 2 = good fidelity
- 3 = some fidelity
- 4 = poor fidelity
- 5 = unusable

Efficient Bandwidth Consumption with Adobe Acrobat Connect Professional

While delivering a high-quality user experience, Adobe Acrobat Connect Professional also minimizes bandwidth consumption, utilizing far less bandwidth than the industry standard:

Total Bandwidth Consumption Comparison:



Total bandwidth consumption reflected above was measured on a total kilobits received basis, for the PowerPoint file and the streamed video combined, and were measured using through the logging functionality available through the My Computer Management Tool.

More efficient bandwidth consumption means that Adobe Acrobat Connect Professional users are likely to have a better web conferencing experience in a variety of settings such as from remote offices, home offices, or while traveling. This also means that in high-traffic times, when networks are congested, the Adobe Acrobat Connect Professional web conferencing experience is likely to be far better. While users benefit from this experience, IT departments also see less strain on their infrastructure and hear better user feedback on the quality of applications they provide.

Please see Exhibit A: Screen Sharing Testing Methodology for more information on the screen sharing testing and results.

Conclusion

Today's web conferencing often includes the sharing of content rich material via screen sharing. To be successful, screen sharing performance should include minimal latency, maximum smoothness, and true fidelity. At the same time, the screen sharing of rich content should be done efficiently to minimize the bandwidth required and the impact on the network. Adobe Acrobat Connect Professional, with Turbo Screen Sharing capabilities, outperforms the industry average on all of these metrics and delivers a superior screen sharing experience.

To learn more about how Adobe Acrobat Connect Professional can help your organization, please contact your Adobe sales representative at 1-888-649-2990 or www.adobe.com/products/acrobatconnectpro.

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Exhibit A: Screen Sharing Testing Methodology

Products Tested

The following products, equally weighted, comprise the “industry average”:

Product	Version
WebEx Meeting Manager/Meeting Center	Trial Version 7.5.3 L
Microsoft Live Meeting	Trial Version 7.9.3006.0
Citrix GoToMeeting	Trial Version 3.0 Build 198
Yugma	Trial Version 2.0.4.5

Materials Tested

Two files, a PowerPoint and a video being streamed from a website, were used in the testing. The content included high resolution graphics, video and animation with rapidly moving content. The same files were used for all tests.

PowerPoint Presentation	PresentationTest3.ppt
File Size	13.9 MB (14,626,816 bytes)
Run Length	4 min 6 sec (246 sec)

Streaming Video	Trailer from http://spiderman3.sonypictures.com/
File Size	n/a (streaming content)
Dimensions	537 x 255 (h x v pixels)
Run Length	2 min 35 sec (155 sec)

Test Environment

The following systems were used for all testing:

	Presenter System	Client System
System Model	Dell Precision Workstation 670	Dell OptiPlex GX260
Operating System	Microsoft Windows XP Professional 5.1.2600 Service Pack 2 Build 2600	Microsoft Windows XP Professional 5.1.2600 Service Pack 2 Build 2600
Processor	x86 Family 15 Model 4 Stepping 10 GenuineIntel ~3192 Mhz x 2	x86 Family 15 Model 2 Stepping 7 GenuineIntel ~2656 Mhz
Physical RAM	2 GB	2 GB

Test Procedure

Latency, Smoothness, and Fidelity were tested using the same content (outlined above) multiple times to ensure accuracy.

Bandwidth consumption was measured using the logging functionality available through the *My Computer Management Tool*. Consumption was measured on a *total* kilobits received basis and also on an *average* kilobits received basis on the client system. These tests were also run multiple times to ensure accuracy.

Adobe Acrobat Connect Professional utilized the *Fast Images* setting. For other vendors who did not offer similar settings, the default settings were used.

All tests were independently run and verified by handI Consulting in conjunction with Shasta QA.

Metrics Used

Latency, Smoothness, and Fidelity were each rated on a scale of 1 to 5:

	Latency	Smoothness	Fidelity
	Lag time between the content being presented and the screen share image being received.	Level of smoothness on the screen refresh from the participant point of view.	Fidelity of the content being shared, with particular attention to the colors and gradient
1	no latency (between 0s and 0.5s): latency is hardly perceivable when making a screen by screen comparison	very smooth: no perception of any frame being dropped.	high fidelity: screen by screen comparison shows that colors and gradient are preserved.
2	little latency (between 0.5 and 1.5s): latency is noticeable on screen by screen comparison but would not be noticeable in a web conference.	smooth: some choppiness but the overall experience is really smooth.	good fidelity: screen by screen comparison shows that some colors are not exactly the same.
3	some latency (between 1.5s and 5s): latency is noticeable looking only at the participant screen.	choppy: content refresh is choppy all the time.	some fidelity: screen by screen comparison shows that 50% of the colors are well rendered while the other 50% are not.
4	high latency (above 5s): there is a significant delay which really impairs the screen sharing experience.	very choppy: choppiness impacts the quality of the content shared and participant lose a significant amount of information.	poor fidelity: screen by screen comparison shows that most colors are not properly rendered.
5	unusable (above 20s): latency is so high that any screen refresh takes more than 20s to reach participant.	unusable: the content being screen shared is unwatchable because it is too choppy.	unusable: screen by screen comparison shows that all colors scheme are not consistent.

Bandwidth utilization was captured by:
 Total bandwidth (kbits)
 Average bandwidth (kbits)

Results of both files were combined.

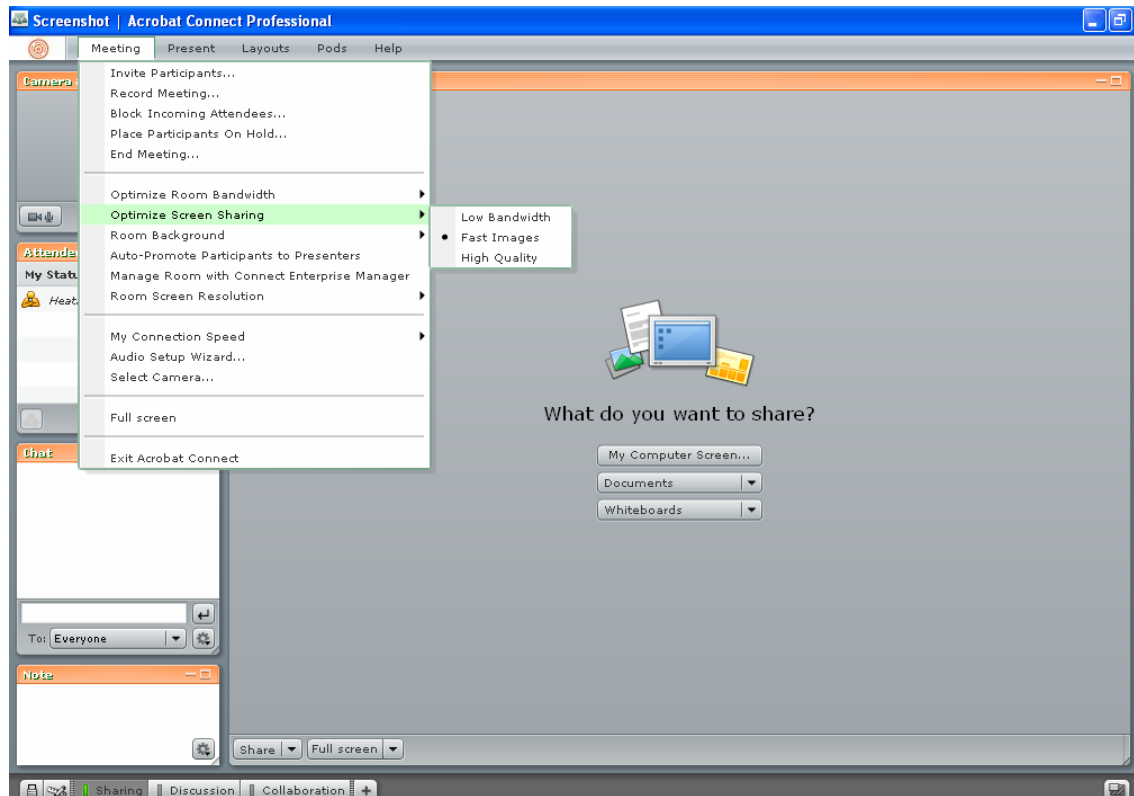
Results

Adobe Acrobat Connect Professional results were above average in all categories:

	Adobe Acrobat Connect SP3	Industry Average
Latency	1	2.25
Smoothness	2	3
Fidelity	1.5	2
Total Bandwidth Consumption	93,752 kbits	228,703 kbits
Average Bandwidth Consumption	256 kbits	692 kbits

Exhibit B: Configuring Adobe Acrobat Connect Professional

At the start of a web conference, presenters can choose from three screen sharing settings to maximize the screen sharing experience for conference participants. At the top of Adobe Acrobat Connect Professional, under *Menu*, presenters will now be able to select three options within *Optimize Screen Sharing*:



Adobe Acrobat Connect Professional: New Screen Sharing Settings

Low Bandwidth – Default setting. Ideal for low bandwidth environments, this setting delivers lower frame rate with 75% of the quality of “highest quality”.

Fast Images – Best for higher bandwidth environments, this setting delivers higher frame rates with 75% of “highest quality”.

High Quality – When the quality of the material is most important, this setting delivers lower frame rate with the highest quality the codec delivers and very close to the original source image.

Additionally, bandwidth settings can also be adjusted by the presenter from the LAN (Local Area Network) default setting to a DSL/Cable setting, or Modem settings, to accommodate participants in lower bandwidth environments.

Exhibit C: What's New: Improved Performance with Adobe Acrobat Connect Professional

Existing Adobe Acrobat Connect Professional users will benefit from an improved screen sharing experience --- with less latency, more smoothness, and higher fidelity. Additionally, Adobe Acrobat Connect Professional has become even more efficient with bandwidth consumption, offering better quality even in low bandwidth settings, with less strain on IT.

With new technology, Adobe Acrobat Connect Professional has the following improvements:

Less latency – Delays between what is presented and what is seen by attendees has been reduced, providing a more real-time web conferencing experience, even with rich content.

More smoothness – Fast moving, data intensive content, is now presented more smoothly, allowing complex PowerPoint and video, to flow better.

Higher fidelity – Content is now truer to its source than before, so screen sharing presenters and web conferencing attendees can enjoy more consistency with images, colors, and gradients.

More efficient bandwidth consumption – While offering a better user experience, Adobe Acrobat Connect Professional also utilizes less bandwidth than before, enabling attendees in low bandwidth areas or congested situations, better access to rich content.