



# Avid<sup>®</sup> ISIS<sup>®</sup> | 7500 - 7000 v4.7.4

## Performance and Redistribution Guide

### Change History

Date	Release	Changes
6/12/2015	4.7.4 (June Update)	<ul style="list-style-type: none"> <li>Updated section 13.1 "Single Blade Removal Redistribution for Mirrored Storage Groups" with new timings to include time for initialization (Pass 1) and corrected 60% and 90% full results for 512k chunk size.</li> </ul>
4/28/2015	4.7.4 (April Update)	<ul style="list-style-type: none"> <li>Updated FCPX Uncompressed data table.</li> <li>Added XAVC-Intra to Media Composer tables</li> <li>Added support for Media Composer v8.3.1</li> </ul>
2/12/2015	4.7.4	Changes to several tables & table layouts; new tables for 2K/UHD/4K in section 10.2, added XDCAM50 for 1080p/23.976 data
11/14/2014	4.7	<ul style="list-style-type: none"> <li>Updates to section 6.0</li> <li>Updates to section 10.0</li> <li>Updates to section 12.0</li> <li>Updates to section 14.0</li> <li>Corrected Adobe Premiere version</li> </ul>
6/10/2013	4.7	Updated for 4.7 release
12/1/2013	4.6	<ul style="list-style-type: none"> <li>Add new OS and editor version support</li> <li>Make table headings repeat across pages</li> <li>Add i8000 related data</li> </ul>
10/1/2013	4.5	<ul style="list-style-type: none"> <li>New client support (Win 8 and RedHat)</li> <li>New resolution support (XAVC and 2K with DS 11.x)</li> <li>Updated FCP and Adobe Premiere supported streams</li> </ul>
12/31/2012	4.2	<ul style="list-style-type: none"> <li>Added What's new for 4.2/4.0.3 (section 1)</li> <li>Updated to include ISIS 2000-120 TB (section 12)</li> <li>Updated editor version support (section 8)</li> <li>Added new Adobe CS6 results (section 11)</li> <li>Updated Interplay Central (ICPS/ICS) section (section 7)</li> <li>Noted reduced record track count for Pro Tools (section 6)</li> <li>General revision updates</li> </ul>
9/12/2012	v4.1	<ul style="list-style-type: none"> <li>Added ISIS 2000</li> <li>Added new platforms tested</li> <li>Added DNxHD 100 and J2k stream counts</li> <li>Minor updates to some redistributions values</li> <li>Added new HP and Lenovo editing platforms</li> </ul>
6/6/2012	v4.0	<ul style="list-style-type: none"> <li>Added Airspeed 5000 to sections 6.2 and 6.3</li> <li>Updated the stream counts for Interplay Central in section 8</li> <li>Added i4000 related information to (section 8)</li> </ul>

This document provides performance guidance for the Avid ISIS v4.7 release, including charts detailing the bandwidth required for supported resolutions in multiple formats. Expected performance and the duration of redistributions have been outlined. This release supports Symphony/Media Composer v8.x, 7.0.x and 6.5.x.

The performance and bandwidth data included in this document were observed during testing at Avid, and do not represent a guarantee of performance or error-free operation. Avid recommends using a play-out server for play-to-air workflows.

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## 1.0 What's New for ISIS 7500 - 7000 v4.7.4

For a complete list of features new to 4.7.4 refer to the Avid ISIS ReadMe. This document only covers performance-related features for ISIS 7500 - 7000.

- Support for Media Composer 8.3 (also supported in ISIS v4.7.3)
- FCPX 10.1.2 support and related configuration note.
- New platform support: HP, Dell, Lenovo
- Support for uncompressed UHD (23.976 DPX) on 2 X 10 Gb Mac OS 10.10 "Yosemite"
- Support for new proxy resolutions in Media Composer, including multi-cam

## 2.0 What's new for ISIS 7500 | 7000 v4.7

For a complete list of features new to 4.7 refer to the Avid ISIS ReadMe. This document only covers performance-related features for ISIS 7500 - 7000.

- The v4.7 release supports real-time, collaborative high-resolution workflows with third-party creative applications with ISIS online systems.
- The v4.7 release supports dual 10 Gb network connections on all ISIS systems for higher bandwidth.
- A Redistribution Monitor now displays progress and estimated time to complete.
- A single stream of 1:1 10 bit 1080i 59.94 is now supported on Windows 7 and 8 using the 2 X 1 Gb configuration.
- This release supports 10 Gb clients using Adobe Premiere Pro.
- This release supports Red Hat Enterprise Linux versions 6.2, 6.3, and 6.5 on ISIS clients.

## 3.0 What's new for ISIS 7500 | 7000 v4.6

- The 4.6 release supports the ISIS 7500 128TB Engine using the new i8000 ISB.
- Avid has added support for Windows v8.1 and Mac OSX v10.9.

## 4.0 What's new for ISIS 7000 v4.5

- The Avid ISIS 7000, Avid ISIS 5500 | 5000 and Avid ISIS 2000 infrastructures now support clients with the Windows 8 64-bit operating system.

Note: Version 4.5 will be the last ISIS Client Manager release tested on workstations and laptops with the Microsoft Windows XP and Windows Vista Operating Systems. Avid recommends that you update your client Operating Systems to Windows 7 or Windows 8 if you plan to upgrade to future versions of ISIS software.

- This release supports Symphony/Media Composer v7.0.x, 6.5.x, 6.x and 5.5.x.
- The Avid ISIS 7000, Avid ISIS 5500 | 5000 and Avid ISIS 2000 infrastructures now support Red Hat® Enterprise Linux® v6.2 and 6.3 clients. 1 Gb and 10 Gb connections are supported. At this time 2 X 1 Gb offers redundancy with no performance benefit.
- Mac OSX finder level copy performance and directory navigation improvements: ISIS v4.5 dramatically increases the performance of copying files to and from ISIS workspaces and allows you to browse directories with high file counts quickly. Directory browsing performance improvements will only be realized on newly copied material—any material that was written to ISIS workspaces prior to v4.5 may exhibit degraded performance until the files are copied to a new ISIS location. Note that moving workspaces from one storage group to another will not improve performance for browsing existing directories—the directories and files themselves must be copied to another location.
- Mixing media from two ISIS infrastructures, ISIS 5000 and/or 7000, up to DNxHD 220 resolutions.

## 5.0 What's New for ISIS 7000 v4.0.3 / 2000 v4.2

The ISIS v4.2 software kit includes ISIS 7000 v4.0.3, ISIS 5000 v4.0.3, and ISIS 2000 v4.2. The Avid ISIS v4.2 Client Manager software is required for ISIS 7000 v4.0.3, ISIS 5000 v4.0.3, and ISIS 2000 v4.2 infrastructures. For a list of what's new in ISIS v4.2, see the ReadMe.

This document includes performance-related details on the ISIS 2000 (nearline) half populated configuration introduced in the v4.2 release. This release of ISIS also introduces support for Apple Mountain Lion v10.8, Symphony/Media Composer 6.5, as well as Adobe CS6. There have also been updates to the ICPS/ICS and Adobe Premiere sections of this document.

## 6.0 Revisions from ISIS v4.01/4.1 and Prior to This Guide

The ISIS v4.2 software kit includes ISIS 7000 v4.0.3, ISIS 5000 v4.0.3, and ISIS 2000 v4.2. The Avid ISIS v4.1 or v4.2 Client Manager software is required for ISIS 7000 v4.0.x, ISIS 5000 v4.0.x, and ISIS 2000 v4.1 or v4.2 infrastructures. For a list of what's new in ISIS v4.2, see the Avid ISIS v4.2 ReadMe.

This document includes performance-related details on the ISIS 2000 (nearline) v4.1 and v4.2 releases. Some minor changes to the ISIS 7000 and ISIS 5000 v4.0 stream counts have changed for v4.0.1; DNxHD 100 and J2k resolutions have also been added.

Avid ISIS v4.0 Client Manager software is supported in the ISIS 7000 v2.4, ISIS 7000 v4.0, ISIS 5000 v3.2, and ISIS 5000 v4.0 infrastructures. Avid ISIS 7000 v4.0 and ISIS 5000 v4.0 infrastructure software requires Avid ISIS v4.0 Client Manager software. For a complete list of new features see the ISIS v4.0 ReadMe. The following is a list of new performance-related features that were added in the Avid ISIS v4.0 release:

- Avid has completed its characterization of Adobe Premiere Pro version CS5.5 64-bit clients in an Avid ISIS v4.0 shared storage environment.
- Avid ISIS v4.0 supports up to 24 Engines providing additional on-line shared storage using a second Management Domain (stack). The Avid ISIS 7000 Setup Guide provides instructions for connecting the 24 Engines; see ["Performance Guidance Using More Than 12 Engines"](#) on page 38.
- Higher stream counts are now supported for DNxHD resolutions depending on your connection type.
- Higher performance for the 2 X 1 Gb client connections.
- Added support for Macintosh Lion clients, both 32 bit kernel using Symphony/Media Composer v5.5.3 and 64 bit kernel using Symphony/Media Composer v6.x.
- Support for Avid Pro Tools 10.
- Avid has qualified dual client connections with two ISIS infrastructures as follows:
  - Single client connections to two ISIS 5000 infrastructures
  - Single client connections to two ISIS 7000 infrastructures
  - Single client connections to an ISIS 5000 and an ISIS 7000 infrastructure
- Improved aggregate performance and capacity capabilities for ISIS v2.4
- Support for a single ISIS to grow up to 20 chassis (mirrored only)
- Additional 10 Gb and 1 Gb client connectivity via EXS switch



*You must still adhere to the engine/switch ratings published in this guide. Each EXS is limited to up to 20 X 1 Gb client connections and not more than 1 X 10 Gb client connections per 10 Gb link to a Management Domain.*

- Improved Performance Capabilities for ISIS v2.2.x
- Support for RAID6 Storage Groups
- Performance guidance during storage element failure with RAID6
- Additional streams counts for mirrored Storage Groups
- Performance guidance for Avid AirSpeed and AirSpeed Multi Stream devices
- Macintosh 10 Gb Ethernet UHRC support
- Windows 7 client support
- Capturing with Windows clients using Nitris DX and Mojo DX to RAID6 workspaces have been qualified

Avid ISIS scales in a linear fashion and is based on the amount of bandwidth an ISIS engine (or several engines) are able to provide.

The following table defines an engine’s capabilities based on the chunk size, protection type and switch type in use. A mix of Avid editors and test tools in Zone 1, 2 and 3 were used to generate bandwidth on the system during testing.

## 7.0 Engine Bandwidth Performance Ratings (MB/s) with Avid Devices

- To determine the available bandwidth for mirrored Storage Groups when utilizing a mix of readers and writers, multiply the write rate x2, then subtract the results from the Read engine rating.
- To determine the available bandwidth for RAID6 Storage Groups when utilizing a mix of readers and writers, multiply the write rate x2.2, then subtract the results from the Read engine rating.
- For Clients working on RAID6 protected Workspaces, set the ISIS Client Type to Medium Resolution.
- Exceeding 90% capacity will reduce the available bandwidth by 15%.

Note: To avoid lower performance on Windows 8.1 clients with 2x1Gb connections to ISIS 7000, check the following related to the Windows Firewall:

1. Make sure the network profile for the adapter connected to the ISIS network is either private or domain. If it is set to public, check the ISIS Client Manager General Preferences to make sure the Public network profile is enabled. Windows firewall settings changes in the ISIS client take effect upon the next reboot.
2. Confirm the Windows Firewall is turned on for the proper network profile assigned to the network between the client and ISIS.

Block Size	256KB Chunk Size				512KB Chunk Size			
	Mirrored ISS1000 or ISS2000				Mirrored ISS2000		RAID6	
	SD Writes	SD Reads	HD/SD Writes	HD/SD Reads	Writes	Reads	Writes	Reads
i8000	N/T	N/T	N/T	N/T	200	400	170	400
i4000	N/T	N/T	N/T	N/T	200	400	170	400
i2000	N/T	N/T	N/T	N/T	200	400	170	400
i1000	150	300	120	240	200	400	170	400
i500	150	300	120	240	200	400	170	400

### Legend


- N/T indicates not tested.

## 7.2 Examples of How to Apply Engine Ratings

### Example 1: Single engine using a mirrored Storage Group with a mix of capture and playback devices

# of Clients	Client Type	Protection Type	Chunk Size	Switch	Format/ Resolution	# of Streams	Data Rate per Stream	Bandwidth
1	10 Gb	Mirrored	512 KB	ISS2000	1080i / 8Bit HD	2 (reader)	125 MB/s	250 MB/s
2	1 Gb	Mirrored	512 KB	ISS2000	1080i /720p DNxHD220	2 (reader)	28 MB/s	112 MB/s
2	1 Gb	Mirrored	512 KB	ISS2000	30i / DV50	1 (writes)	8 MB/s	32 MB/s
Total Bandwidth Required = 394 MB/s								

**Passed:** In this example the total throughput required falls in line with the read engine rating of 400 MB/s used when mixing capture and playback devices.

 Captures to a mirrored Storage Group are 2X when mixing with playback clients.

### Example 2: Single engine using a mirrored Storage Group with a mix of capture and playback devices

# of Clients	Client Type	Protection Type	Chunk Size	Switch	Format/ Resolution	# of Streams	Data Rate per Stream	Bandwidth
1	10 Gb	Mirrored	512 KB	ISS2000	1080i / 10Bit HD	2 (reader)	150 MB/s	300 MB/s
1	1 Gb	Mirrored	512 KB	ISS2000	1080i 59.94 DNxHD220	2 (reader)	28 MB/s	56 MB/s
1	1 Gb	Mirrored	512 KB	ISS2000	1080i 59.94 DNxHD220	1 (writer)	28 MB/s	56 MB/s
Total Bandwidth Required = 412 MB/s								


**Failed:** In this example the total throughput required does not fall in line with the read engine rating of 400 MB/s.

 Captures to a mirrored Storage Group are 2X when mixing with playback clients.

### Example 3: Single engine using a RAID6 Storage Group with only capture devices

# of Clients	Client Type	Protection Type	Chunk Size	Switch	Format/ Resolution	# of Streams	Data Rate per Stream	Bandwidth
3	ASMS	RAID6	512 KB	ISS2000	1080i 59.94 XDCAM50 Mb	4 (writer)	10 MB/s	120 MB/s
1	ASMS	RAID6	512 KB	ISS2000	30i / DV50	2 (writer)	10 MB/s	20 MB/s
2	ASC	RAID6	512 KB	ISS2000	30i / DV50	1 (writer)	10 MB/s	20 MB/s
Total Bandwidth Required = 160 MB/s								

**Passed:** The total throughput required falls in line with the write engine rating of 200 MB/s.

 This was 100% capture devices.

### Example 4: Single engine using a RAID6 Storage Group with a mix of capture and playback devices

# of Clients	Client Type	Protection Type	Chunk Size	Switch	Format/ Resolution	# of Streams	Data Rate per Stream	Bandwidth
3	ASMS	RAID6	512 KB	ISS2000	1080i 59.94 XDCAM50 Mb	4 (reader)	10 MB/s	120 MB/s
2	ASC	RAID6	512 KB	ISS2000	30i / DV50	1 (reader)	10 MB/s	20 MB/s
2	ASMS	RAID6	512 KB	ISS2000	1080i 59.94 XDCAM50 Mb	4 (writer)	10 MB/s	176 MB/s
1	ASMS	RAID6	512 KB	ISS2000	30i / DV50	1 (writer)	10 MB/s	22 MB/s
Total Bandwidth Required = 338 MB/s								

**Passed:** The total throughput required falls in line with the read engine rating of 400 MB/s used when mixing capture and playback devices.

 Captures to a mirrored Storage Group are 2X when mixing with playback clients.

## Legend


- ASMS = AirSpeed Multi Stream
- ASC = AirSpeed Classic

## 8.0 Switch Performance

The performance for Avid ISIS clients and servers is based on the generation of the switch hardware (ISS and IXS) in the engine and the Chunk Size. The following gives you a base number of the MB/s you can expect of each generation.

### Avid ISIS Switch Performance (MB/s)

Block Size	256KB Chunk Size		512KB Chunk Size	
	ISS1000	ISS2000	ISS1000	ISS2000
Switch				
Bandwidth	230	600	N/T	600


 These ratings can be attained by using 10 Gb, 1 Gb, or a combination of both.

The following are guidelines as to the number of clients that are supported in Zone 1 (directly connected to an ISS in an ISIS 7000 Engine). When a 10 Gb device is connected to your ISS, some of the 1 Gb ports cannot be used:

- High Resolution 1 Gb clients — four or fewer with one Ultra High Resolution 10 Gb client
- Medium Resolution 1 Gb clients — five or fewer with one Ultra High Resolution 10 Gb client

### Example of How to Apply ISS2000 Ratings to a Mirrored Storage Group


# of Clients	Client Speed	Size of trunk	Resolution	Chunk Size	Format	Rate per client (MB/sec)	Bandwidth	Pass / Fail
4	10 Gb	20 Gb	1:1 10Bit HD	512 KB	1080i 59.94	150	1228.8 MB/s	Pass
5	10 Gb	20 Gb	1:1 10Bit HD	512 KB	1080i 59.94	150	1536 MB/s	Fail
10	1 Gb	10 Gb	DNxHD220	512 KB	1080i 59.94	28	560 MB/s	Pass
11	1 Gb	10 Gb	DNxHD220	512 KB	1080i 59.94	28	616 MB/s	Fail
40	1 Gb	40 Gb	DNxHD220	512 KB	1080i 59.94	28	2355.2 MB/s	Pass

 A Cisco 4900M was the Zone 2 and 3 switch used during testing. All bandwidth is based on reading 2 streams of video and 8 audio tracks.

### Example of How to Apply ISS2000 Ratings to a RAID6 Storage Group

# of Clients	Client Speed	Size of trunk	Resolution	Chunk Size	Format	Rate per client (MB/sec)	Bandwidth	Pass / Fail
22	1 Gb	20 Gb	XDCAM50 Mb	512 KB	1080i 59.94	8	352 MB/s	Pass
76	1 Gb	20 Gb	XDCAM50 Mb	512 KB	1080i 59.94	8	1249.3 MB/s	Fail
40	1 Gb	10 Gb	DV50	512 KB	30i	8	576 MB/s	Pass
45	1 Gb	10 Gb	DV50	512 KB	30i	8	720 MB/s	Fail

 Multiply writes to a RAID6 Storage Group by x2.2.

 A Cisco 4900M was the Zone 2 and 3 switch used during testing. All bandwidth is based on reading 2 streams of video and 8 audio tracks.

## 9.0 RAID6 Performance Guidance during Storage Element Failures


One of the advantages of RAID6 is the ability to continue working during the event of Storage Element failure. If this occurs, your engine rating is degraded by 30% of its normal operation. See the redistribution section for the amount of

bandwidth that can be sustained during the recovery process. The following are examples of how to apply engine ratings during a Storage Element failure.

**Example 1: Single engine using a RAID6 Storage Group with capture devices only**

# of Clients	Client Type	Protection Type	Chunk Size	Switch	Resolution	# of Streams	Data Rate per Stream	Bandwidth
2	ASMS	RAID6	512 KB	ISS2000	DV50	2 (writer)	10 MB/s	40 MB/s
2	ASC	RAID6	512 KB	ISS2000	DV50	1 (writer)	10 MB/s	20 MB/s
Total Bandwidth Required = 60 MB/s								


**Passed:** The total throughput required falls in line with the degraded write engine rating which is now 140 MB/s in this state (70% of 200 MB/s).

 This was 100% capture devices.

**Example 2: Two engines using a RAID6 Storage Group with only capture devices**

# of Clients	Client Type	Protection Type	Chunk Size	Switch	Format/Resolution	# of Streams	Data Rate per Stream	Bandwidth
1	ASC	RAID6	512 KB	ISS2000	DV50	1 (reader)	10 MB/s	10 MB/s
3	ASMS	RAID6	512 KB	ISS2000	XDCAM50 Mb	2 (writer)	10 MB/s	132 MB/s
1	ASMS	RAID6	512 KB	ISS2000	DV50	2 (writer)	10 MB/s	44 MB/s
Total Bandwidth Required = 240 MB/s								

**Passed:** The total throughput required falls in line with the degraded engine rating of a two engine Storage Group which is now 560 MB/s in this state (70% of 800 MB/s).

 Capture to a RAID6 Storage Group is 2.2 when mixing with playback clients.

Legend

- o ASMS = AirSpeed Multi Stream
- o ASC = AirSpeed Classic

## 10.0 Tested Stream Counts

### 10.1 High Resolution Collaboration (2K/4K/5K) via AMA

For the ISIS 4.7 release Avid has tested several 2K, 4K and 5K-based formats using Media Composer, via AMA in a 1080p project, as well as using several 3<sup>rd</sup> party applications commonly used with these formats. The table below describes what formats have been observed to work successfully with the 4.7 release using a single stream of each. These resolutions also have platform requirements; see each application's documentation.

Format/Codec	Bit Depth	Frame Rate	Bandwidth (MB/sec)	Application Supported	
				Mac	Windows
REDCODE 5K 8:1	12 bit	59.94	84	Adobe Premiere Pro CC AutoDesk Smoke BlackMagic Resolve	Media Composer 7 Media Composer 8
REDCODE 5K 4:1	12 bit	24	118	Media Composer 7 Media Composer 8 AutoDesk Smoke	Media Composer 7 Media Composer 8 Adobe Premiere Pro CC
ProRes 422 HQ 4K	10 bit	24	150	Adobe Premiere Pro CC	
XAVC 422 4K	10 bit	24	30	Media Composer 8	Media Composer 7 Media Composer 8 Adobe Premiere Pro CC



- Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution.
- Orange cells indicate 10 Gb, UHRC client type, connection required.

## 10.2 Tested Stream Counts with Avid Editors

Media Composer 8.3 has introduced several new project types and formats in the 2K, UHD and 4K space, as well as the DNxHR codec to go along with those. Because stream counts will vary greatly depending on the machine type and the timeline setting, from now on this guide will provide information only about the bandwidth usage for a single stream and the storage consumption associated with it. For specific platform requirements when using these high resolution projects see the Media Composer 8.3 ReadMe.

The charts in this section define the bandwidth used per resolution and a recommended stream count, with the exception mentioned above. Take the following into consideration when reading the tables below. Avid stresses that the information in the following charts is based on the Avid ISIS default file system chunk size.

All bandwidth ratings have been adjusted to include up to 8 tracks of 16 bit audio @ 48 KHz. For supported application revisions, see the *Avid ISIS ReadMe*.

The sequences used in Avid testing have two second audio and video cuts offset by one second.

- △ The ISIS 4.7 release introduces support for a 2 X 10 Gb NIC (Myricom 10G-PCIE2-8B2-2S) to increase overall throughput. It can be connected in Zones 1, 2 and 3 on different subnets, or the same subnet, although the former is preferred for resiliency.
- △ 3D stereoscopic full frame capture of 1:1 10 bit or 1:1 8 bit material requires a 10 Gb connection and a minimum of two engines, except in the cases where the aggregate write bandwidth is 200 MB/sec or lower.
- △ Several resolutions in the charts below support 3D stereoscopic. Full frame playback/capture is equal to two streams for a given resolution. For example, 1:1 10 bit full frame 3D stereo is equivalent to 300 MB/sec. Resolutions that support full frame 3D stereoscopic are in yellow. With the optional dual DNxHD or AVCI codec cards in Nitris DX the DNxHD or AVCI resolutions are available for full frame 3D stereoscopic.
- △ ProRes resolutions are available on Macintosh only and are indicated by italics.
- △ With the optional dual DNxHD or AVCI codec cards in Nitris DX the DNxHD or AVCI resolutions are available for full frame 3D stereoscopic.
- △ RAID6 Storage Groups only support resolutions of 50 Mbps and below. Multi-cam has not been tested on RAID6 Storage Groups.
- △ For some platforms, achieving the highest stream count may require switching the video quality mode during playback operations. (e.g. Draft or Full Quality).
- △ 10-bit RGB is limited to single stream in 1080 formats only and requires the use of Media Composer 5.0, Symphony 5.0 or NewsCutter 9.0 or later.
- △ 10-bit RGB playback and capture is supported on 64-Bit operating systems only.
- △ Clients with 2 X 1 Gb connections that are doing uncompressed HD resolutions (i.e., UHRC) must set the ISIS Client type to Ultra High Resolution.
- △ Stream counts higher than 4 are limited to Media Composer 6.0 or higher for all resolutions except Multi-cam.

The results in the following charts were achieved using the platforms and editors listed in *Hardware and Software Used During Testing on page 37*. Stream counts vary depending on the platform and editor version. You might be able to achieve higher stream counts on the newer platforms. Additionally, headroom has to be considered as editors will burst above the resolution rate in order to fill the play buffer, especially during JKL and scrubbing operations.

### DV

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
		1	2	3	4	5	6	7	8	4-way	9-way	
DV 25	30i NTSC PAL	4	8	12	16	N/T	N/T	N/T	N/T	20	40	14
DV 50	30i NTSC PAL	8	16	24	N/T	N/T	N/T	N/T	N/T	40	80	28

#### Legend

- Shaded cells indicate 10 Gb connectivity required (UHRC) not supported during redistribution.

- N/T indicates not tested.

## MPEG

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
		1	2	3	4	5	6	7	8	4-way	9-way	
IMX/MPEG 30	30i NTSC 25i PAL	4	8	12	16	N/T	N/T	N/T	N/T	20	40	14
IMX/MPEG 40	30i NTSC 25i PAL	5	10	15	20	N/T	N/T	N/T	N/T	25	50	18
IMX/MPEG 50	30i NTSC 25i PAL	8	16	24	32	N/T	N/T	N/T	N/T	40	80	28

### Legend

- Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution.
- N/T indicates not tested.

## JFIF Progressive

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
		1	2	3	4	5	6	7	8	4-way	9-way	
35:1	24p 23.976p NTSC	1.5	3	4.5	6	N/T	N/T	N/T	N/T	7.5	15	5
35:1	25p, 24p PAL	1.5	3	4.5	6	N/T	N/T	N/T	N/T	7.5	15	5
28:1	24p, 23.976p NTSC	1.5	3	4.5	6	N/T	N/T	N/T	N/T	7.5	15	5
28:1	25p, 24p PAL	1.5	3	4.5	6	N/T	N/T	N/T	N/T	7.5	15	5
14:1	24p, 23.976p NTSC	2.5	5	7.5	10	N/T	N/T	N/T	N/T	12.5	25	9
14:1	25p, 24p PAL	2.5	5	7.5	10	N/T	N/T	N/T	N/T	12.5	25	9
3:1	24p, 23.976p NTSC	6	12	18	24	N/T	N/T	N/T	N/T	30	60	21
3:1	25p, 24p PAL	7	14	21	28	N/T	N/T	N/T	N/T	35	70	25
2:1 SD	24p, 23.976p NTSC	8	16	24	N/T	N/T	N/T	N/T	N/T	40	80	28
2:1 SD	25p, 24p PAL	9.5	19	28.5	N/T	N/T	N/T	N/T	N/T	47.5	95	33
1:1 SD	24p, 23.976p NTSC	17.5	35	N/T	N/T	N/T	N/T	N/T	N/T	87.5	175	62
1:1 SD	25p, 24p PAL	22	44	N/T	N/T	N/T	N/T	N/T	N/T	110	220	77
1:1 10b SD	24p, 23.976p NTSC	22	44	N/T	N/T	N/T	N/T	N/T	N/T	110	220	77
1:1 10b SD	25p, 24p PAL	25	50	N/T	N/T	N/T	N/T	N/T	N/T	125	250	88
VC1-APL0	25p	1	2	3	N/T	N/T	N/T	N/T	N/T	N/T	N/T	2.7
VC1-APL1	25p	1.5	3	4.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	5.5

### Legend

- Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution.
- Orange cells indicate 10 Gb, UHRC client type, connection required.
- Yellow cells indicate resolutions available for 3D stereoscopic.
- N/T indicates not tested.

## JFIF Interlaced

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
		1	2	3	4	5	6	7	8	4-way	9-way	
15:1s	30i NTSC, 25i PAL	1.5	3	4.5	6	N/T	N/T	N/T	N/T	7.5	15	5
4:1s	30i NTSC, 25i PAL	2.5	5	7.5	10	N/T	N/T	N/T	N/T	12.5	25	9
2:1s	30i NTSC, 25i PAL	4	8	12	16	N/T	N/T	N/T	N/T	20	40	14
20:1	30i NTSC, 25i PAL	2	4	6	8	N/T	N/T	N/T	N/T	10	20	7
10:1	30i NTSC, 25i PAL	3	6	9	12	N/T	N/T	N/T	N/T	15	30	11
3:1	30i NTSC, 25i PAL	7	14	21	28	N/T	N/T	N/T	N/T	35	70	25
2:1	30i NTSC, 25i PAL	9.5	19	28.5	N/T	N/T	N/T	N/T	N/T	47.5	95	33
1:1 SD	30i NTSC, 25i PAL	22	44	N/T	N/T	N/T	N/T	N/T	N/T	110	220	77
1:1 10b SD	30i NTSC, 25i PAL	28.5	57	N/T	N/T	N/T	N/T	N/T	N/T	142.5	285	100
VC1-APL0	30i NTSC, 24, 23.976, 25i PAL	1	1.5	3	N/T	N/T	N/T	N/T	N/T	N/T	N/T	2.7
VC1-APL1	30i NTSC, 24, 23.976, 25i PAL	1.5	3	4.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	5.5
VC1-APL2	30i NTSC, 24, 23.976, 25i PAL	3	6	9	N/T	N/T	N/T	N/T	N/T	N/T	N/T	11

### Legend

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- Yellow cells indicate resolutions available for 3D stereoscopic.
- N/T indicates not tested.

2K

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
		1	2	3	4	5	6	7	8	4-way	9-way	
2K GEN*	2K/24 2048 X 1556	286	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	962

\*Avid DS 11.x only

1080i

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
		1	2	3	4	5	6	7	8	4-way	9way	
RGB 10-bit *	1080i/59.94	240	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	864
1:1 10-bit HD	1080i/59.94	150	300	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	527
1:1 HD	1080i/59.94	125	250	375	N/T	N/T	N/T	N/T	N/T	N/T	N/T	439
ProRes 4444	1080i/59.94	42	84	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	148
DNxHD 220 X	1080i/59.94	28	56	84	112	140	168	196	224	140	280	98
DNxHD 220	1080i/59.94	28	56	84	112	140	N/T	N/T	N/T	140	280	98
ProRes HQ	1080i/59.94	28	56	84	N/T	N/T	N/T	N/T	N/T	N/T	N/T	98
DNxHD 145	1080i/59.94	18.5	37	55.5	74	92.5	111	129.5	148	92.5	185	65
ProRes	1080i/59.94	18.5	37	55.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	65
DNxHD 100	1080i/59.94	14	28	42	56	70	84	N/T	N/T	70	N/T	46
J2K**	1080i/59.94	19*	38*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	66
ProRes LT	1080i/59.94	13	26	39	N/T	N/T	N/T	N/T	N/T	N/T	N/T	46
XDCAM50	1080i/59.94	8	16	24*	32*	N/T	N/T	N/T	N/T	40*	80	28
XDCAM35	1080i/59.94	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	1080i/59.94	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
XDCAM17.5	1080i/59.94	2.5	5	N/T	N/T	N/T	N/T	N/T	N/T	12.5	N/T	9
DVCPRO HD	1080i/59.94	14.5	29	43.5	58	72.5	N/T	N/T	N/T	58	145	51
AVC-Intra 50	1080i/59.94	8	16	24*	32*	N/T	N/T	N/T	N/T	44	N/T	28
AVC-Intra 100	1080i/59.94	14	28	42*	56*	N/T	N/T	N/T	N/T	70	N/T	50
XAVC 100	1080i/59.94	14	28	42*	56*	N/T	N/T	N/T	N/T	N/T	N/T	50
ProRes Proxy	1080i/59.94	5	10	15	20	25	N/T	N/T	N/T	N/T	N/T	18
H264 Proxy 800k	1080i/59.94	0.1	0.3	0.4	0.6	0.7	0.8	1	1.1	0.5	1	0.34
H264 Proxy 2 Mb	1080i/59.94	0.4	0.8	1.2	1.6	2	2.4	N/T	N/T	1	2	1.4
RGB 10-bit *	1080i 50	206	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	742
1:1 10-bit HD	1080i 50	131	262	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	461
1:1 HD	1080i 50	105	210	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	369
ProRes 4444	1080i 50	36	72	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	127
DNxHD 185 X	1080i 50	23.5	47	70.5	94	117.5	141	164.5	188	117.5	235	83
DNxHD 185	1080i 50	23.5	47	70.5	94	117.5	141	164.5	188	117.5	235	83
ProRes HQ	1080i 50	23.5	47	70.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	83
DNxHD 120	1080i 50	16	32	48	64	80	96	112	128	80	160	56
ProRes	1080i 50	16	32	48	64	80	N/T	N/T	N/T	N/T	N/T	56
J2K**	1080i 50	16*	32*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	56
ProRes LT	1080i 50	11	22	33	44	55	N/T	N/T	N/T	N/T	N/T	39
DVCPRO HD	1080i 50	14.5	29	43.5	58	72.5	N/T	N/T	N/T	58	145	51
XDCAM50	1080i 50	8	16	24*	32*	N/T	N/T	N/T	N/T	40*	80*	28
XDCAM35	1080i 50	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	1080i 50	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
XDCAM17.5	1080i 50	2.5	5	N/T	N/T	N/T	N/T	N/T	N/T	12.5	N/T	9
AVC-Intra 50	1080i 50	8	16	24*	32*	N/T	N/T	N/T	N/T	44*	N/T	28
AVC-Intra 100	1080i 50	14	28	42*	56*	N/T	N/T	N/T	N/T	70*	N/T	50
XAVC	1080i 50	14	28	42*	56*	N/T	N/T	N/T	N/T	N/T	N/T	50
ProRes Proxy	1080i 50	4	8	12	16	N/T	N/T	N/T	N/T	N/T	N/T	14
H264 Proxy	1080i 50	1	2	3	4	5	N/T	N/T	N/T	N/T	N/T	3.5

(\*) Minimum Platform/Memory requirements must be met. Refer to the Symphony/Media Composer ReadMe associated to the version of software you are using for detailed platform support.

(\*\*) Estimated average as compression is variable rate.

## Legend

- Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution.
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1080p

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
		1	2	3	4	5	6	7	8	4-way	9way	
RGB 10-bit *	1080p/29.97	240	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	864
1:1 10-bit HD	1080p/29.97	150	300	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	527
1:1 HD	1080p/29.97	125	250	375	N/T	N/T	N/T	N/T	N/T	N/T	N/T	439
RGB DNxHD 444 440 X	1080p/29.97	55	110	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	194
RGB ProRes 4444	1080p/29.97	42	84	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	148
DNxHD 220 X	1080p/29.97	28	56	84	112	140	168	196	224	140	280	98
DNxHD 220	1080p/29.97	28	56	84	112	140	168	196	224	140	280	98
ProRes HQ	1080p/29.97	28	56	84	N/T	N/T	N/T	N/T	N/T	N/T	N/T	98
DNxHD 145	1080p/29.97	18.5	37	55.5	74	92.5	111	129.5	148	92.5	185	65
ProRes	1080p/29.97	18.5	37	55.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	65
DNxHD 100	1080p/29.97	14	28	42	56	70	84	N/T	N/T	70	N/T	46
J2k**	1080p/29.97	19*	38*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	67
ProRes LT	1080p/29.97	13	26	39	52	65	N/T	N/T	N/T	N/T	N/T	46
XDCAM50	1080p/29.97	8	16	24*	32*	N/T	N/T	N/T	N/T	40*	N/T	28
XDCAM35	1080p/29.97	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	1080p/29.97	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
DNxHD 45	1080p/29.97	6	12	18	24	30	N/T	N/T	N/T	30	60	21
ProRes Proxy	1080p/29.97	5	10	15	20	25	30	N/T	N/T	N/T	N/T	18
RGB 10-bit *	1080p/25	206	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	742
1:1 10-bit HD	1080p/25	131	262	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	461
1:1 HD	1080p/25	105	210	315	N/T	N/T	N/T	N/T	N/T	N/T	N/T	373
RGB DNxHD 444 365 X	1080p/25	46	92	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	162
RGB ProRes 4444	1080p/25	36	72	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	127
DNxHD 185 X	1080p/25	23.5	47	70.5	94	117.5	141	164.5	188	117.5	235	83
DNxHD 185	1080p/25	23.5	47	70.5	94	117.5	141	164.5	188	117.5	235	83
ProRes HQ	1080p/25	23.5	47	70.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	83
DNxHD 120	1080p/25	16	32	48	64	80	96	112	128	80	160	56
ProRes	1080p/25	16	32	48	N/T	N/T	N/T	N/T	N/T	N/T	N/T	56
J2k**	1080p/25	16*	32*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	56
ProRes LT	1080p/25	11	22	33	44	55	N/T	N/T	N/T	N/T	N/T	39
XDCAM50	1080p/25	8	16	N/T	N/T	N/T	N/T	N/T	N/T	40	N/T	28
XDCAM35	1080p/25	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	1080p/25	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
DNxHD 36	1080p/25	5	10	15	20	25	30	35	40	25	50	18
ProRes Proxy	1080p/25	4	8	12	16	20	24	N/T	N/T	N/T	N/T	14
RGB 10-bit *	1080p/24	196	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	706
1:1 10-bit HD	1080p/24	126	252	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	443
1:1 HD	1080p/24	101	202	303	N/T	N/T	N/T	N/T	N/T	N/T	N/T	355
RGB DNxHD 444 350 X	1080p/24	44	88	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	155
RGB ProRes 4444	1080p/24	35	70	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	123
DNxHD 175 X	1080p/24	23	46	69	92	115	138	161	184	115	230	81
DNxHD 175	1080p/24	23	46	69	92	115	138	161	184	115	230	81
ProRes HQ	1080p/24	23	46	69	N/T	N/T	N/T	N/T	N/T	N/T	N/T	81
DNxHD 115	1080p/24	15.5	31	46.5	62	77.5	93	108.5	124	77.5	155	54
ProRes	1080p/24	15.5	31	46.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	54
J2k**	1080p/24	15*	30*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	53
ProRes LT	1080p/24	10	20	30	N/T	N/T	N/T	N/T	N/T	N/T	N/T	35
XDCAM35	1080p/24	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	1080p/24	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
XDCAM17.5	1080p/24	2.5	5	N/T	N/T	N/T	N/T	N/T	N/T	12.5	N/T	9
DNxHD 36	1080p/24	5	10	15	20	25	30	35	40	25	50	18
H264 Proxy 800k	1080p/24	0.1	0.3	0.4	0.6	0.7	0.8	1	1.1	0.5	1	0.34
ProRes Proxy	1080p/24	4	8	12	16	20	N/T	N/T	N/T	N/T	N/T	14
RGB 10-bit *	1080p/23.976	196	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	706

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
<b>1:1 10Bit HD</b>	1080p/23.976	150	300	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	527
<b>1:1 HD</b>	1080p/23.976	101	202	303	N/T	N/T	N/T	N/T	N/T	N/T	N/T	355
<b>RGB DNxHD 444 350 X</b>	1080p/23.976	44	88	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	155
<b>RGB ProRes 4444</b>	1080p/23.976	35	70	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	123
<b>DNxHD 175 X</b>	1080p/23.976	23	46	69	92	115	138	161	184	115	230	81
<b>DNxHD 175</b>	1080p/23.976	23	46	69	92	115	138	161	184	115	230	81
<b>ProRes HQ</b>	1080p/23.976	23	46	69	N/T	N/T	N/T	N/T	N/T	N/T	N/T	81
<b>DNxHD 115</b>	1080p/23.976	15.5	31	46.5	62	77.5	93	108.5	124	77.5	155	54
<b>ProRes</b>	1080p/23.976	15.5	31	46.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	54
<b>J2k**</b>	1080p/23.976	15*	30*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	53
<b>ProRes LT</b>	1080p/23.976	9	18	27	36	N/T	N/T	N/T	N/T	N/T	N/T	32
<b>XDCAM50</b>	1080p/23.976	7	14	21	28	35	42	49	56	25	N/T	25
<b>XDCAM35</b>	1080p/23.976	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
<b>XDCAM25</b>	1080p/23.976	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
<b>XDCAM17.5</b>	1080p/23.976	2.5	5	N/T	N/T	N/T	N/T	N/T	N/T	12.5	N/T	9
<b>DNxHD 36</b>	1080p/23.976	5	10	15	20	25	30	35	40	25	50	18
<b>AVC-Intra 50</b>	1080p/23.976	8	16	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	28
<b>AVC-Intra 100</b>	1080p/23.976	14	28	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	50
<b>ProRes Proxy</b>	1080p/23.976	4	8	12	16	20	N/T	N/T	N/T	N/T	N/T	14

(\*) Minimum Platform/Memory requirements must be met. Refer to the Symphony/Media Composer ReadMe associated to the version of software you are using for detailed platform support.

(\*\*) Estimated average as compression is variable rate.

Legend

- o Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution.
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- o Yellow cells indicate resolutions available for 3D stereoscopic.
- o N/T indicates not tested.

720p

Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
		1	2	3	4	5	6	7	8	4-way	9way	
1:1 10-bit HD	720p/59.94	142	284	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	499
1:1 HD	720p/59.94	106	212	318	N/T	N/T	N/T	N/T	N/T	N/T	N/T	373
DNxHD 220 X	720p/59.94	28	56	84	N/T	N/T	N/T	N/T	N/T	140	280	98
DNxHD 220	720p/59.94	28	56	84	N/T	N/T	N/T	N/T	N/T	140	280	98
ProRes HQ	720p/59.94	28	56	84	N/T	N/T	N/T	N/T	N/T	N/T	N/T	98
DNxHD 145	720p/59.94	18.5	37	55.5	N/T	N/T	N/T	N/T	N/T	92.5	185	65
ProRes	720p/59.94	18.5	37	55.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	65
DNxHD 100	720p/59.94	14	28	42	56	N/T	N/T	N/T	N/T	70	150	46
J2k**	720p/59.94	19*	38*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	67
ProRes LT	720p/59.94	13	26	39	52	N/T	N/T	N/T	N/T	N/T	N/T	46
XDCAM50	720p/59.94	8	16	24*	32*	N/T	N/T	N/T	N/T	40*	N/T	28
XDCAM35	720p/59.94	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	720p/59.94	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
DVCPRO HD	720p/59.94	14.5	29	43.5	N/T	N/T	N/T	N/T	N/T	72.5	145	51
AVC-Intra 50	720p/59.94	8	16	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	28
AVC-Intra 100	720p/59.94	14	28	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	50
VC1-APL2	720p/59.94	3	6	9	N/T	N/T	N/T	N/T	N/T	N/T	N/T	11
H264 Proxy 800k	720p/59.94	0.1	0.3	0.4	0.6	0.7	0.8	1	1.1	0.5	1	0.34
H264 Proxy 2Mb	720p/59.94	0.4	0.8	1.2	1.6	2	2.4	N/T	N/T	1	2	1.4
ProRes Proxy	720p/59.94	5	10	15	20	N/T	N/T	N/T	N/T	N/T	N/T	18
1:1 10-bit HD	720p/50	120	240	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	422
1:1 HD	720p/50	89	178	267	N/T	N/T	N/T	N/T	N/T	N/T	N/T	313
DNxHD 185 X	720p/50	23.5	47	70.5	N/T	N/T	N/T	N/T	N/T	117.5	235	83
DNxHD 185	720p/50	23.5	47	70.5	N/T	N/T	N/T	N/T	N/T	117.5	235	83
ProRes HQ	720p/50	23.5	47	70.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	83
DNxHD 120	720p/50	15	30	45	N/T	N/T	N/T	N/T	N/T	75	150	53
ProRes	720p/50	15	30	45	N/T	N/T	N/T	N/T	N/T	N/T	N/T	53
J2k**	720p/50	16*	32*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	57
ProRes LT	720p/50	11	22	33	44	N/T	N/T	N/T	N/T	N/T	N/T	39
XDCAM50	720p/50	8	16	24*	32*	N/T	N/T	N/T	N/T	40*	N/T	28
XDCAM35	720p/50	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	720p/50	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
DVCPRO HD	720p/50	8	16	N/T	N/T	N/T	N/T	N/T	N/T	40	N/T	28
AVC-Intra 50	720p/50	8	16	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	28
AVC-Intra 100	720p/50	14	28	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	50
VC1-APL2	720p/50	3	6	9	N/T	N/T	N/T	N/T	N/T	N/T	N/T	11
ProRes Proxy	720p/50	4	8	12	16	N/T	N/T	N/T	N/T	N/T	N/T	14
1:1 10-bit HD	720p/29.97	71	142	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	250
1:1 HD	720p/29.97	53	106	159	N/T	N/T	N/T	N/T	N/T	N/T	N/T	186
DNxHD 220 X	720p/29.97	28	56	84	N/T	N/T	N/T	N/T	N/T	140	280	98
DNxHD 220	720p/29.97	28	56	84	N/T	N/T	N/T	N/T	N/T	140	280	98
ProRes HQ	720p/29.97	28	56	84	N/T	N/T	N/T	N/T	N/T	N/T	N/T	98
DNxHD 145	720p/29.97	18.5	37	55.5	N/T	N/T	N/T	N/T	N/T	92.5	185	65
ProRes	720p/29.97	18.5	37	55.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	65
DNxHD 110	720p/29.97	14	28	42	56	N/T	N/T	N/T	N/T	N/T	N/T	50
J2k**	720p/29.97	10*	20*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	36
ProRes LT	720p/29.97	13	26	39	52	N/T	N/T	N/T	N/T	N/T	N/T	46
DVCPRO HD	720p/29.97	14.5	29	43.5	N/T	N/T	N/T	N/T	N/T	72.5	145	51
1:1 10-bit HD	720p/25	60	120	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	211
1:1 HD	720p/25	48	96	144	N/T	N/T	N/T	N/T	N/T	N/T	N/T	169
DNxHD 90 X	720p/25	12	24	36	N/T	N/T	N/T	N/T	N/T	60	120	42
DNxHD 90	720p/25	12	24	36	N/T	N/T	N/T	N/T	N/T	60	120	42
ProRes HQ	720p/25	12	24	36	N/T	N/T	N/T	N/T	N/T	N/T	N/T	42
DNxHD 60	720p/25	8	16	24	N/T	N/T	N/T	N/T	N/T	40	80	28



Resolution	Project Format	Number of Streams per client (MB/s)								Multi-cam (MB/s)		GB/Hr
ProRes	720p/25	8	16	24	N/T	N/T	N/T	N/T	N/T	N/T	N/T	28
J2k**	720p/25	9*	18*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	32
ProRes LT	720p/25	7	14	21	N/T	N/T	N/T	N/T	N/T	N/T	N/T	25
XDCAM35	720p/25	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	720p/25	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
AVC-Intra 50	720p/25	8	16	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	28
AVC-Intra 100	720p/25	14	28	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	50
1:1 10-bit HD	720p/23.976	58	116	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	204
1:1 HD	720p/23.976	46	92	138	N/T	N/T	N/T	N/T	N/T	N/T	N/T	162
DNxHD 90 X	720p/23.976	11.5	24	35.5	N/T	N/T	N/T	N/T	N/T	57.5	115	40
DNxHD 90	720p/23.976	11.5	24	35.5	N/T	N/T	N/T	N/T	N/T	57.5	115	40
ProRes HQ	720p/23.976	11.5	24	35.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	40
DNxHD 60	720p/23.976	7.5	16	22.5	N/T	N/T	N/T	N/T	N/T	37.5	75	26
ProRes	720p/23.976	7.5	16	22.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	26
J2k**	720p/23.976	8*	16*	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	29
ProRes LT	720p/23.976	6.5	13	19.5	N/T	N/T	N/T	N/T	N/T	N/T	N/T	23
XDCAM35	720p/23.976	5	10	N/T	N/T	N/T	N/T	N/T	N/T	25	N/T	18
XDCAM25	720p/23.976	3.5	7	N/T	N/T	N/T	N/T	N/T	N/T	17.5	N/T	13
DVCPRO HD	720p/23.976	14.5	29	43.5	N/T	N/T	N/T	N/T	N/T	72.5	145	51
AVC-Intra 50	720p/23.976	8	16	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	28
AVC-Intra 100	720p/23.976	14	28	N/T	N/T	N/T	N/T	N/T	N/T	N/T	N/T	50
VC1-APL2	720p/23.976	3	6	9	N/T	N/T	N/T	N/T	N/T	N/T	N/T	11
ProRes Proxy	720p/23.976	4	8	12	16	N/T	N/T	N/T	N/T	N/T	N/T	14

(\*) Minimum Platform/Memory requirements must be met. Refer to the Symphony/Media Composer ReadMe associated to the version of software you are using for detailed platform support.

(\*\*) Estimated average as compression is variable rate.

Legend

- Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution.
- Orange cells indicate 10 Gb, UHRC client type, connection required.
- Yellow cells indicate resolutions available for 3D stereoscopic.
- N/T indicates not tested.

2K with Media Composer v8.3

Resolution	Project Format	Bandwidth per stream	GB/Hr
<ul style="list-style-type: none"> <li>• Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution</li> <li>• Orange cells indicate 10 Gb, UHRC client type, connection required.</li> </ul>			
DNxHR 4:4:4	2048x1080/23.976	44	156
DNxHR High Quality (10 bit)	2048x1080/23.976	23	79
DNxHR High Quality (8 bit)	2048x1080/23.976	23	79
DNxHR Standard Quality	2048x1080/23.976	15	53
DNxHR Low Bandwidth	2048x1080/23.976	4	15
DNxHR 4:4:4	2048x1080/24	44	156
DNxHR High Quality (10 bit)	2048x1080/24	23	79
DNxHR High Quality (8 bit)	2048x1080/24	23	79
DNxHR Standard Quality	2048x1080/24	15	53
DNxHR Low Bandwidth	2048x1080/24	4	15
DNxHR 4:4:4	2048x1080/25	46	163
DNxHR High Quality (10 bit)	2048x1080/25	23	81



Resolution	Project Format	Bandwidth per stream	GB/Hr
<ul style="list-style-type: none"> <li>Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution</li> <li>Orange cells indicate 10 Gb, UHRC client type, connection required.</li> </ul>			
DNxHR High Quality (8 bit)	2048x1080/25	23	81
DNxHR Standard Quality	2048x1080/25	15	54
DNxHR Low Bandwidth	2048x1080/25	5	18
DNxHR 4:4:4	2048x1080/29.97	55	195
DNxHR High Quality (10 bit)	2048x1080/29.97	28	97
DNxHR High Quality (8 bit)	2048x1080/29.97	28	97
DNxHR Standard Quality	2048x1080/29.97	18	65
DNxHR Low Bandwidth	2048x1080/29.97	6	20
DNxHR 4:4:4	2048x1080/48	89	312
DNxHR High Quality (10 bit)	2048x1080/48	45	156
DNxHR High Quality (8 bit)	2048x1080/48	45	156
DNxHR Standard Quality	2048x1080/48	30	104
DNxHR Low Bandwidth	2048x1080/48	9	33
DNxHR 4:4:4	2048x1080/50	93	325
DNxHR High Quality (10 bit)	2048x1080/50	46	163
DNxHR High Quality (8 bit)	2048x1080/50	46	163
DNxHR Standard Quality	2048x1080/50	31	108
DNxHR Low Bandwidth	2048x1080/50	10	34
DNxHR 4:4:4	2048x1080/59.94	111	390
DNxHR High Quality (10 bit)	2048x1080/59.94	56	195
DNxHR High Quality (8 bit)	2048x1080/59.94	56	195
DNxHR Standard Quality	2048x1080/59.94	37	130
DNxHR Low Bandwidth	2048x1080/59.94	12	40

### UHD with Media Composer v8.3

Resolution	Project Format	Bandwidth per stream	GB/Hr
<ul style="list-style-type: none"> <li>Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution</li> <li>Orange cells indicate 10 Gb, UHRC client type, connection required</li> </ul>			
DNxHR 4:4:4	3840x2160/23.976	168	591
DNxHR High Quality (10 bit)	3840x2160/23.976	89	313
DNxHR High Quality (8 bit)	3840x2160/23.976	89	313
DNxHR Standard Quality	3840x2160/23.976	56	197
DNxHR Low Bandwidth	3840x2160/23.976	18	63
XAVC-Intra (MC v8.3.1 or later)	3840x2160/23.976	29	102
DNxHR 4:4:4	3840x2160/24	168	591
DNxHR High Quality (10 bit)	3840x2160/24	89	313
DNxHR High Quality (8 bit)	3840x2160/24	89	313

Resolution	Project Format	Bandwidth per stream	GB/Hr
<ul style="list-style-type: none"> <li>Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution</li> <li>Orange cells indicate 10 Gb, UHRC client type, connection required</li> </ul>			
DNxHR Standard Quality	3840x2160/24	56	197
DNxHR Low Bandwidth	3840x2160/24	18	63
DNxHR 4:4:4	3840x2160/25	175	615
DNxHR High Quality (10 bit)	3840x2160/25	88	309
DNxHR High Quality (8 bit)	3840x2160/25	88	309
DNxHR Standard Quality	3840x2160/25	58	204
DNxHR Low Bandwidth	3840x2160/25	18	63
XAVC-Intra (MC v8.3.1 or later)	3840x2160/25	29	102
DNxHR 4:4:4	3840x2160/29.97	210	738
DNxHR High Quality (10 bit)	3840x2160/29.97	105	369
DNxHR High Quality (8 bit)	3840x2160/29.97	105	369
DNxHR Standard Quality	3840x2160/29.97	70	246
DNxHR Low Bandwidth	3840x2160/29.97	22	77
XAVC-Intra (MC v8.3.1 or later)	3840x2160/29.97	36	127
DNxHR 4:4:4	3840x2160/48	334	1173
DNxHR High Quality (10 bit)	3840x2160/48	167	586
DNxHR High Quality (8 bit)	3840x2160/48	167	586
DNxHR Standard Quality	3840x2160/48	110	388
DNxHR Low Bandwidth	3840x2160/48	34	121
DNxHR 4:4:4	3840x2160/50	350	1230
DNxHR High Quality (10 bit)	3840x2160/50	175	615
DNxHR High Quality (8 bit)	3840x2160/50	175	615
DNxHR Standard Quality	3840x2160/50	115	404
DNxHR Low Bandwidth	3840x2160/50	37	130
DNxHR High Quality (10 bit)	3840x2160/59.94	209	735
DNxHR High Quality (8 bit)	3840x2160/59.94	209	735
DNxHR Standard Quality	3840x2160/59.94	138	485
DNxHR Low Bandwidth	3840x2160/59.94	44	155

### 4K with Media Composer v8.3

Resolution	Project Format	Bandwidth per stream	GB/Hr
<ul style="list-style-type: none"> <li>Gray cells indicate 2 X 1 Gb or 10 Gb connectivity required. UHRC resolutions are not supported during redistribution</li> <li>Orange cells indicate 10 Gb, UHRC client type, connection required</li> </ul>			
DNxHR 4:4:4	4096x2160/23.976	185	650
DNxHR High Quality (10 bit)	4096x2160/23.976	90	316
DNxHR High Quality (8 bit)	4096x2160/23.976	90	316
DNxHR Standard Quality	4096x2160/23.976	59	207
DNxHR Low Bandwidth	4096x2160/23.976	18	63
XAVC-Intra (MC v8.3.1 or later)	3840x2160/23.976	29	102
DNxHR 4:4:4	4096x2160/24	185	650
DNxHR High Quality (10 bit)	4096x2160/24	90	316
DNxHR High Quality (8 bit)	4096x2160/24	90	316
DNxHR Standard Quality	4096x2160/24	59	207
DNxHR Low Bandwidth	4096x2160/24	18	63
DNxHR 4:4:4	4096x2160/25	187	657
DNxHR High Quality (10 bit)	4096x2160/25	94	330
DNxHR High Quality (8 bit)	4096x2160/25	94	330
DNxHR Standard Quality	4096x2160/25	62	218
DNxHR Low Bandwidth	4096x2160/25	20	70
XAVC-Intra (MC v8.3.1 or later)	3840x2160/25	29	102
DNxHR 4:4:4	4096x2160/29.97	222	780
DNxHR High Quality (10 bit)	4096x2160/29.97	112	394
DNxHR High Quality (8 bit)	4096x2160/29.97	112	394
DNxHR Standard Quality	4096x2160/29.97	74	260
DNxHR Low Bandwidth	4096x2160/29.97	24	84
XAVC-Intra (MC v8.3.1 or later)	3840x2160/29.97	36	127
DNxHR 4:4:4	4096x2160/48	356	1251
DNxHR High Quality (10 bit)	4096x2160/48	178	626
DNxHR High Quality (8 bit)	4096x2160/48	178	626
DNxHR Standard Quality	4096x2160/48	118	414
DNxHR Low Bandwidth	4096x2160/48	37	129
DNxHR 4:4:4	4096x2160/50	370	1301
DNxHR High Quality (10 bit)	4096x2160/50	188	661
DNxHR High Quality (8 bit)	4096x2160/50	188	661
DNxHR Standard Quality	4096x2160/50	125	439
DNxHR Low Bandwidth	4096x2160/50	39	137
DNxHR High Quality (10 bit)	4096x2160/59.94	224	788
DNxHR High Quality (8 bit)	4096x2160/59.94	224	788
DNxHR Standard Quality	4096x2160/59.94	150	527

DNxHR Low Bandwidth	4096x2160/59.94	46	162
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### 10.3 Tested Stream Counts with Avid Non-Editor Capture Devices

The following charts outline Avid tested capture devices and stream counts. The bandwidth displayed is the suggested bandwidth limit setting by resolution. The GB/Hr column represents the use of a single stream.

Resolution	Device	Number of Streams per Client (MB/s)				GB/Hr per Stream
		1	2	3	4	
XDCAM-HD 17.5 Mb	AirSpeed 5000	10	20	30	40	36
XDCAM-HD 35 Mb	AirSpeed 5000	10	20	30	40	36
XDCAM-HD 50 Mb	AirSpeed 5000	10	20	30	40	36
DNxHD100	AirSpeed 5000	14	28	42	56	50
DNxHD145/120	AirSpeed 5000	20	40	60	80	65
DNxHD220/185	AirSpeed 5000	30	60	N/T	N/T	98
HDV 25 Mb	AirSpeed 5000	10	20	30	40	36
DV50	AirSpeed 5000	10	20	30	40	36
DV25	AirSpeed 5000	10	20	30	40	36
AVC-Intra 50	AirSpeed 5000	10	20	30	40	36
AVC-Intra 100	AirSpeed 5000	14	28	42	56	50
IMX50	AirSpeed 5000	10	20	N/T	N/T	36
IMX30	AirSpeed 5000	10	20	N/T	N/T	22
H264	AirSpeed 5000	1	2	3	4	3.5
XDCAM-HD 17.5 Mb	AirSpeed Multi Steam	10	20	30	40	36
XDCAM-HD 35 Mb	AirSpeed Multi Steam	10	20	30	40	36
XDCAM-HD 50 Mb	AirSpeed Multi Steam	10	20	30	40	36
AVC-Intra 50Mb	AirSpeed Multi Steam	10	20	30	40	36
AVC-Intra 100Mb	AirSpeed Multi Steam	10	20	30	40	36
HDV 25 Mb	AirSpeed Multi Steam	10	20	30	40	36
DV50	AirSpeed Multi Steam	10	20	30	40	36
DV25	AirSpeed Multi Steam	10	20	30	40	36
IMX50	AirSpeed Multi Steam	10	20	N/T	N/T	36
IMX30	AirSpeed Multi Steam	10	20	N/T	N/T	22
DV25	AirSpeed Classic	10	20	N/T	N/T	22
DV50	AirSpeed Classic	10	20	N/T	N/T	36
IMX50	AirSpeed Classic	10	20	N/T	N/T	36
IMX30	AirSpeed Classic	10	20	N/T	N/T	22
DNxHD115	AirSpeed Classic	18	N/T	N/T	N/T	64
DNxHD120	AirSpeed Classic	18	N/T	N/T	N/T	64
DNxHD145	AirSpeed Classic	22	N/T	N/T	N/T	78
SD 1:1	AirSpeed Classic	25	N/T	N/T	N/T	88
DNxHD145	AirSpeed Multi Steam	20	40	N/T	N/T	72
DNxHD220	AirSpeed Multi Steam	30	N/T	N/T	N/T	108

 Bandwidth limiting might be required to achieve the above ratings.

Legend

- N/T indicates not tested.

## 10.4 Tested Stream Counts with Avid Non-Editor Playback Devices

The following table outlines Avid tested playback devices and stream counts. The bandwidth displayed is the suggested bandwidth limit setting by resolution to ensure realtime playback.

Resolution	Device	Number of Streams per client (MB/s)			
		1	2	3	4
XDCAM-HD 17.5 Mb	AirSpeed 5000	10	20	30	40
XDCAM-HD 35 Mb	AirSpeed 5000	10	20	30	40
XDCAM-HD 50 Mb	AirSpeed 5000	10	20	30	40
DNxHD100	AirSpeed 5000	14	28	42	56
DNxHD145/120	AirSpeed 5000	20	40	60	80
DNxHD220/185	AirSpeed 5000	30	60	N/T	N/T
HDV 25 Mb	AirSpeed 5000	10	20	30	40
DV50	AirSpeed 5000	10	20	30	40
DV25	AirSpeed 5000	10	20	30	40
AVC-Intra 50	AirSpeed 5000	10	20	30	40
AVC-Intra 100	AirSpeed 5000	14	28	42	56
IMX50	AirSpeed 5000	10	20	30	40
IMX30	AirSpeed 5000	10	20	30	40
XDCAM-HD 17.5 Mb	AirSpeed Multi Steam	10	20	30	40
XDCAM-HD 35 Mb	AirSpeed Multi Steam	10	20	30	40
XDCAM-HD 50 Mb	AirSpeed Multi Steam	10	20	30	40
DNxHD145	AirSpeed Multi Steam	20	40	N/T	N/T
DNxHD220	AirSpeed Multi Steam	30	N/T	N/T	N/T
HDV 25 Mb	AirSpeed Multi Steam	10	20	30	40
DV50	AirSpeed Multi Steam	10	20	30	40
DV25	AirSpeed Multi Steam	10	20	30	40
IMX50	AirSpeed Multi Steam	10	20	30	40
IMX30	AirSpeed Multi Steam	10	20	30	40
DV25	AirSpeed Classic	6	12	N/A	N/A
DV50	AirSpeed Classic	10	20	N/A	N/A
IMX50	AirSpeed Classic	10	20	N/A	N/A
IMX30	AirSpeed Classic	6	12	N/A	N/A
DNxHD115	AirSpeed Classic	16	32	N/A	N/A
DNxHD120	AirSpeed Classic	16	32	N/A	N/A
DNxHD145	AirSpeed Classic	21	42	N/A	N/A
SD 1:1	AirSpeed Classic	25	50	N/A	N/A



*Bandwidth limiting might be required to achieve the above ratings.*

### Legend

- N/T indicates not tested.
- When playing two tracks of compressed audio with H.264 media please budget 1.8 MB/sec. of bandwidth

## 11.0 Pro Tools Performance

The ISIS 4.7 client on ISIS 7000 supports Pro Tools versions 10 and 11. ISIS 7000 supports streaming for Pro Tools 9 clients on Windows while only push/pull is supported on the Mac. This limitation does not apply to clients using Pro Tools 10 and 11. ISIS v4.6 supports up to 9 clients per engine using mirrored storage groups only. For the ISIS 4.7 release up to 64 tracks are supported with 6 GB or more of memory and the max cache setting in the playback engine. For more specific details regarding Pro Tools on ISIS, see the following URL:

<http://avid.custkb.com/avid/app/selfservice/search.jsp?DocId=353969>

## 12.0 Interplay Central Performance

For greater detail regarding Interplay Central Refer to the version of the ICS How to Buy Hardware Guide that corresponds with your ICS version, available on the Avid Knowledge Base. The following stream counts were achieved per Interplay Central server per engine for the most recent version:

Resolution	Interplay Central		Interplay Sphere		iNews iOS	
	1 Gb Server Link	10 Gb Server Link	1 Gb Server Link	10 Gb Server Link	1 Gb Server Link	10 Gb Server Link
AVC Intra 100, DNxHD 145, 45; DVCPRO-HD	N/T	16 (12)	N/T	16 (12)	N/T	16 (12)
AVC Intra 100	N/T	10	N/T	10	N/T	10
XDCAMHD 50, DNxHD 45	12	24 (15)	12	24 (15)	12	24 (15)
AVC intra 50	10 (8)	10 (8)	10 (8)	10 (8)	10 (8)	10 (8)
XDCAM EX 35, IMX50	16	42 (34)	16	36 (30)	16	42 (34)
XDCAM HD 35/17.5	18	36 (24)	18	30 (20)	18	36 (24)
DV50	12	56 (36)	12	52 (32)	12	50 (36)
DV 25; IMX 30/40	20	42 (40)	20	42 (40)	20	42 (40)
Proxy (h.264 - 2 Mbps)	80 (70)	80 (70)	40 (32)	40 (32)	N/T	N/T
Proxy (h.264 - 800 Kbps)	120 (100)	120 (100)	60 (50)	60 (50)	N/T	N/T
Proxy /h.263	80	80 (80)	30 (24)	30 (24)	N/T	N/T



*Values in parenthesis reflect the use of a G7 based server.*

## 13.0 Redistribution and Performance for Mirrored and RAID6

ISIS 4.7 introduces the Redistribution Monitor feature, accessed via the Tools menu in the Management Console. This feature displays the overall progress of the redistribution as well as the aggregate rate at which the data is moving. Additionally, you can monitor the progress of individual Storage Managers. ISIS 4.7 users should refer to the Redistribution Monitor to determine the completion time for a given redistribution. The redistribution results in section 13 of this document are based on tests using the 4.6 software. However, the results will be close to what is expected in 4.7 and can be used as a reference.

As of version 4.7 there is a two-pass process involved. The first pass (Pass 1) is the Initialization phase. The second pass (Pass 2) is the Data Movement phase. The values in the following tables are only based on the Data Movement phase (Pass 2). The amount of time to complete Pass 1 can vary greatly based on several factors, including:

- number of workspaces
- number and type of ISBs
- number of configuration changes, etc.

For example, a system with 100 workspaces can take up to 1.5 hours to complete Pass 1.

The numbers provided in this section are based on a healthy system. If your system exhibits any unexpected failures or issues, these numbers may vary.

The following sections help you understand the amount of bandwidth that can be sustained during redistribution and the time to completion based on the used capacity of a given configuration. UHRC resolutions are not supported during redistribution. Take the following tables into consideration.

We support 50% load of chassis full rating during redistribution.

Limitations on expected client performance during redistribution include the following:

- Reducing audio tracks from 8 to 4 during playback might be required during redistribution. (Normal operation supports 2 streams of video 8 tracks of audio.)
- Reducing the number of video streams from 2 to 1 might be required during redistribution. (Normal operation supports 2 streams of video.)

### 13.1 Single Blade Removal Redistribution for Mirrored Storage Groups

Use the following tables to estimate the amount of time required when removing a single ISB from an existing *mirrored* Storage Group. The tables are based on the bandwidth to the Storage Group and the amount of data that will be removed from the ISIS Storage Blade (ISB).

#### Estimated Time to Completion with No Bandwidth (Hours)

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	0.75	N/T	0.5	1	3	4
6 Engines	0.5	N/T	0.5	0.75	2.25	3
12 Engines	0.25	N/T	0.25	0.5	2	2
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	1.25	N/T	1	2	5	8
6 Engines	0.75	N/T	0.75	1.25	4	6
12 Engines	0.25	N/T	0.25	0.75	2.25	2.5
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	2	N/T	1.5	3	7	12
6 Engines	1	N/T	1	2	5	8
12 Engines	0.75	N/T	0.5	1	3	4

#### Legend

- N/T indicates not tested.



**Estimated Time to Completion with 120 MB/s of Client Bandwidth per Engine (Hours)**

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	1	N/T	0.75	1.25	3.75	5
6 Engines	0.5	N/T	0.5	0.75	2.25	3
12 Engines	0.25	N/T	0.5	0.75	1.75	2.5
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	2.25	N/T	1.25	2.75	6	10
6 Engines	0.75	N/T	0.75	1.5	4	6
12 Engines	0.5	N/T	0.30	1	2.75	3.5
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	3	N/T	2	4	8.5	15
6 Engines	1	N/T	1	2	5	8
12 Engines	0.75	N/T	0.75	1.25	3.25	4.5

Legend

- N/T indicates not tested.

**Estimated Time to Completion with 200 MB/s of Client Bandwidth per Engine (Hours)**

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	N/T	N/T	N/T	N/T
6 Engines	1	N/T	0.5	1	2.75	3.25
12 Engines	1	N/T	0.25	0.5	2	2
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	N/T	N/T	N/T	N/T
6 Engines	1.75	N/T	1	2	4.5	7
12 Engines	2	N/T	0.5	1	3	4
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	N/T	N/T	N/T	N/T
6 Engines	3.25	N/T	1.5	2.75	6	10
12 Engines	3.5	N/T	0.75	1.5	4.25	6.5

Legend

- N/T indicates not tested.

## 13.2 Single Blade Removal Redistribution for RAID6 Storage Groups

Use the following tables to estimate the amount of time required when removing a single ISB from an existing RAID6 Storage Group. The tables are based on the bandwidth to the Storage Group and the amount of data that will be removed from the ISIS Storage Blade (ISB).

### Estimated Time to Completion with No Bandwidth (Hours)

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	1.5	3.5	6.75	13.5
6 Engines	N/T	N/T	1	2	4	8
12 Engines	N/T	N/T	0.5	0.75	1.5	3
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	3.5	7	13.5	27
6 Engines	N/T	N/T	2	4	8	16
12 Engines	N/T	N/T	1	1.5	3	6
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	7.25	15	29	60
6 Engines	N/T	N/T	4	8	16	32
12 Engines	N/T	N/T	2	3	6	12

#### Legend

- N/T indicates not tested.

**Estimated Time to Completion with 140 MB/s of Client Bandwidth per Engine (Hours)**

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	2.5	5	10	20
6 Engines	N/T	N/T	2	4	8	16
12 Engines	N/T	N/T	1.5	2.25	4.5	9
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	5	10	20	40
6 Engines	N/T	N/T	4	8	16	32
12 Engines	N/T	N/T	3	6	12	24
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	10.5	21	42	84
6 Engines	N/T	N/T	7.5	15	30	60
12 Engines	N/T	N/T	5	10	20	40

Legend

- N/T indicates not tested.

### 13.3 Single Blade Add Redistribution Mirrored Storage Groups

Use the following table to estimate the amount of time required when adding a single ISB to an existing Storage Group. The table is based on the bandwidth to the Storage Group, as well as the amount of data being added to the ISIS Storage Blade (ISB).

#### Estimated Time to Completion (Hours) 1-12 Engines

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
No Bandwidth	3	N/T	2.5	5	10	18
120 MB/s of B/W	4	N/T	3	6	11	20
220 MB/s of B/W	6	N/T	4	8	13	24
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
No Bandwidth	6	N/T	4.5	9	17.5	33
120 MB/s of B/W	9	N/T	6	12	20.5	39.5
220 MB/s of B/W	12	N/T	7	14	23	44
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
No Bandwidth	10	N/T	6	12	23	44
120 MB/s of B/W	13	N/T	8	16	28	54
220 MB/s of B/W	19	N/T	9.5	19	39	76

#### Legend

- N/T indicates not tested.

### 13.4 Adding a Single or Multiple Engines to a Mirrored Storage Group

Use the following tables to estimate the amount of time required when adding a single or multiple engines to an existing Storage Group. The tables are based on the bandwidth to the Storage Group, as well as the amount of data being added.

#### Estimated Time to Completion with no Bandwidth (Hours)

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1-2 Engines	2.4	N/T	2.5	5	10	20
2-3 Engines	3.2	N/T	2.5	5	10	20
3-4 Engines	3.6	N/T	2.5	5	10	20
4-5 Engines	3.8	N/T	2.5	5	10	20
5-6 Engines	4	N/T	3	6	12	24
6-7 Engines	4	N/T	3	6	12	24
7-8 Engines	4	N/T	3	6	12	24
8-9 Engines	4	N/T	3	6	12	24
9-10 Engines	4	N/T	3	6	12	24
10-11 Engines	4	N/T	3	6	12	24
11-12 Engines	4	N/T	3	6	12	24
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1-2 Engines	4.8	N/T	5	10	20	40
2-3 Engines	6.3	N/T	5	10	20	40
3-4 Engines	7.1	N/T	5	10	20	40
4-5 Engines	7.6	N/T	5	10	20	40
5-6 Engines	7.9	N/T	6	12	24	48
6-7 Engines	7.6	N/T	6	12	24	48
7-8 Engines	7.4	N/T	6	12	24	48
8-9 Engines	7.5	N/T	6	12	24	48
9-10 Engines	7.6	N/T	6	12	24	48
10-11 Engines	7.7	N/T	6	12	24	48
11-12 Engines	7.9	N/T	6	12	24	48

**Estimated Time to Completion with no Bandwidth (Hours), continued**

Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
<b>1-2 Engines</b>	7.1	N/T	7	14	28	56
<b>2-3 Engines</b>	9.5	N/T	7.5	15	30	60
<b>3-4 Engines</b>	10.7	N/T	7.5	15	30	60
<b>4-5 Engines</b>	11.4	N/T	7.5	15	30	60
<b>5-6 Engines</b>	11.9	N/T	9	18	36	72
<b>6-7 Engines</b>	11.5	N/T	9	18	36	72
<b>7-8 Engines</b>	11.2	N/T	9	18	36	72
<b>8-9 Engines</b>	11.3	N/T	9	18	36	72
<b>9-10 Engines</b>	11.4	N/T	9	18	36	72
<b>10-11 Engines</b>	11.6	N/T	9	18	36	72
<b>11-12 Engines</b>	11.9	N/T	9	18	36	72

Legend

- N/T indicates not tested.

**Estimated Time to Completion with 120 MB/s of Client Bandwidth per Engine (Hours)**

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1-2 Engines	5	N/T	2.5	5	10	20
2-3 Engines	6.5	N/T	2.5	5	10	20
3-4 Engines	7	N/T	3	6	12	24
4-5 Engines	7.5	N/T	3	6	12	24
5-6 Engines	8	N/T	4	8	16	32
6-7 Engines	8	N/T	4	8	16	32
7-8 Engines	8	N/T	4	8	16	32
8-9 Engines	7.5	N/T	5	10	20	40
9-10 Engines	7.5	N/T	5.5	11	22	44
10-11 Engines	8	N/T	5.5	11	22	44
11-12 Engines	8	N/T	6	12	24	48
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1-2 Engines	9.5	N/T	5	10	20	40
2-3 Engines	12.7	N/T	5	10	20	40
3-4 Engines	14.3	N/T	6	12	24	48
4-5 Engines	15.2	N/T	6	12	24	48
5-6 Engines	15.8	N/T	8	16	32	64
6-7 Engines	15.6	N/T	8	16	32	64
7-8 Engines	15.4	N/T	8	16	32	64
8-9 Engines	15.3	N/T	10	20	40	80
9-10 Engines	15.4	N/T	11	22	44	88
10-11 Engines	15.2	N/T	11	22	44	88
11-12 Engines	15.8	N/T	12	24	48	96
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1-2 Engines	14.5	N/T	7.5	15	30	60
2-3 Engines	19.0	N/T	7.5	15	30	60
3-4 Engines	21.5	N/T	9	18	36	72
4-5 Engines	23	N/T	9	18	36	72
5-6 Engines	24	N/T	12	24	48	96
6-7 Engines	24	N/T	12	24	48	96
7-8 Engines	24	N/T	12	24	48	96
8-9 Engines	22.5	N/T	15	30	60	120
9-10 Engines	23	N/T	16.5	33	66	132
10-11 Engines	23	N/T	16.5	33	66	132
11-12 Engines	24	N/T	18	36	72	144

**Legend**

- N/T indicates not tested.

### 13.5 Single Blade Add Redistribution for RAID6 Storage Groups

Use the following table to estimate the amount of time required when adding a single ISB to an existing Storage Group. The table is based on the bandwidth to the Storage Group, as well as the amount of data being added to the ISIS Storage Blade (ISB).

#### Estimated Time to Completion (Hours) 1-12 Engines

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
No Bandwidth	N/T	N/T	3	6	9	18
150 MB/s of B/W	N/T	N/T	5	10	15	30
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
No Bandwidth	N/T	N/T	6	12	18	36
150 MB/s of B/W	N/T	N/T	10	20	30	60
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
No Bandwidth	N/T	N/T	9	18	27	54
150 MB/s of B/W	N/T	N/T	15	30	45	90

#### Legend

- N/T indicates not tested.

### 13.6 Symmetric Redistributions on Storage Groups

The ISIS 2.x release includes dramatic improvements to the time a full redistribution takes to complete. Some full redistributions that formerly took multiple hours can now be completed in a 20 minutes to 2 hours depending on your protection type.

To experience the benefits of these faster full redistributions there are two requirements. First, all workspaces in the Storage Group must participate in the full redistribution. Second, ISB “adds” and “removals” must be done in a symmetric fashion leading up to the full redistribution. This means that the same quantity of ISBs that were removed from a Storage Group need to then be added in a single configuration change.

The following examples explain how this works.

#### Example 1:

- 1) Remove a single ISB from the Storage Group.
- 2) Add a single ISB to the same Storage Group.
- 3) Perform a Full redistribution to all workspaces in the Storage Group.

Total time to completion should be less than 20 minutes.

#### Example 2:

- 1) Remove a single ISB from the Storage Group.
- 2) Remove two ISBs from the Storage Group.
- 3) Add three ISBs back to the Storage Group in a single configuration change.
- 4) Perform a Full redistribution to all workspaces in the Storage Group.

Total time to completion should be less than 20 minutes.



**Example 3:**

- 1) Remove two ISBs from the Storage Group.
- 2) Add one ISB back to the Storage Group in a single configuration change.
- 3) Add one ISB back to the Storage Group in a single configuration change.
- 4) Perform a Full redistribution to all workspaces in the Storage Group.

This example does not qualify for a quick redistribution like the two previous examples because all the ISBs previously removed were not added back in a single configuration change. For non-symmetrical full redistribution guidance, refer to the following tables.

**13.7 Non-Symmetric Full Redistribution for Mirrored Storage Groups**

The following tables should help you estimate the full redistribution times with non-symmetric configuration changes when using a mirrored workspace.

**Estimated Time to Completion with No Bandwidth (Hours)**

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	6.0	N/T	6.3	12.7	26	52
6 Engines	4.7	N/T	5.0	10.0	20	40
12 Engines	3.9	N/T	5.0	10.0	20	40
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	13.5	N/T	12.7	25.3	52	104
6 Engines	11.4	N/T	10.0	20.0	40	80
12 Engines	9.4	N/T	10.0	20.0	40	80
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	27.5	N/T	19.0	38.0	76	152
6 Engines	20.0	N/T	15.0	30.0	60	120
12 Engines	18.0	N/T	15.0	30.0	60	120

Legend

- N/T indicates not tested.

**Estimated Time to Completion with 120 MB/s of Client Bandwidth per Engine (Hours)**

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	6.7	N/T	6.8	13.5	27	54
6 Engines	5.0	N/T	5.8	11.5	23	46
12 Engines	4.2	N/T	5.8	11.5	23	46
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	15.0	N/T	13.5	27.0	54	108
6 Engines	13.0	N/T	11.5	23.0	46	92
12 Engines	11.0	N/T	11.5	23.0	46	92
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	34.0	N/T	20.3	40.5	81	162
6 Engines	26.7	N/T	17.3	34.5	69	138
12 Engines	25.0	N/T	17.3	34.5	69	138

Legend

- N/T indicates not tested.

**Estimated Time to Completion with 200 MB/s of Client Bandwidth per Engine (Hours)**

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	8.5	N/T	7.0	14.0	28	56
6 Engines	7.5	N/T	6.5	12.5	25	50
12 Engines	6.5	N/T	6.5	12.5	25	50
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	18.0	N/T	14.0	28.0	54	108
6 Engines	16.0	N/T	12.5	25.0	46	92
12 Engines	14.0	N/T	12.5	25.0	46	92
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	N/T	N/T	N/T	N/T
6 Engines	N/T	N/T	N/T	N/T	N/T	N/T
12 Engines	N/T	N/T	N/T	N/T	N/T	N/T

Legend

- N/T indicates not tested.

### 13.8 Non-Symmetric Full Redistribution for RAID6 Storage Groups

The following tables should help you estimate the full redistribution times with non-symmetric configuration changes when using a RAID6 workspace.

#### Estimated Time to Completion with no Bandwidth (Hours)

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	5.5	11	22	44
6 Engines	N/T	N/T	6	12	24	48
12 Engines	N/T	N/T	8	14	28	58
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	11	22	44	88
6 Engines	N/T	N/T	12	24	48	96
12 Engines	N/T	N/T	14	26	52	104
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	16.5	33	66	132
6 Engines	N/T	N/T	18	32	64	128
12 Engines	N/T	N/T	18	34	68	134

#### Legend

- N/T indicates not tested.

**Estimated Time to Completion with 100 MB/s of Client Bandwidth per Engine (Hours)**

Capacity Filled Block Size Storage Blade	30% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	6	12	24	48
6 Engines	N/T	N/T	7	13.5	27	54
12 Engines	N/T	N/T	8	15.5	31	62
Capacity Filled Block Size Storage Blade	60% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	12	24	48	96
6 Engines	N/T	N/T	13.5	27	54	108
12 Engines	N/T	N/T	15.5	31	62	124
Capacity Filled Block Size Storage Blade	90% Capacity					
	256 KB		512 KB			
	i1000	i2000/i4000/ i8000	i1000	i2000	i4000	i8000
1 Engine	N/T	N/T	15	30	60	120
6 Engines	N/T	N/T	N/T	34	68	136
12 Engines	N/T	N/T	N/T	39	78	156

**Legend**

- N/T indicates not tested.

## 13.9 Hardware and Software Used During Testing

The following hardware and software were used while testing this release. This table does not reflect all supported platforms.

Platform	OS	CPU	Memory	Editor Version	ISIS Client
HP z840	Windows 7 64-bit	Dual 8 Core 2.6 GHz Intel Xeon E5-2640 v3	64 GB	Media Composer 8.3.1	V4.7.4
HP z440	Windows 7 64-bit	8 Core 3.0 GHz Intel Xeon E5-1660 v3	16 GB	Media Composer 8.3.1	V4.7.4
Dell 7910	Windows 8.1 64-bit Windows 7 64-bit SP1	Dual 10 Core 2.3 GHz Intel Xeon E5-2650	32 GB	Media Composer 8.3.1	V4.7.4
HP z820	Windows 7 64-bit	8 Core 2.6 GHz Intel Xeon Gen2	16 GB	Media Composer 8.0 Media Composer 7.0.3 Media Composer 6.5	V4.7.4
HP z820	Windows 8.1 64-bit Windows 7 64-bit SP1	8 Core 2.7 GHz Intel Xeon	16 GB	Media Composer 8.0 Media Composer 7.0.3 Media Composer 6.5	V4.7.4
Lenovo C30	Windows 8.1 64-bit Windows 7 64-bit SP1	8 Core 2.2 GHz Intel Xeon	16 GB	Media Composer 8.0 Media Composer 7.0.3 Media Composer 6.5	V4.7.4
HP z800	Windows 8.1 64-bit Windows 7 64-bit SP1	6 Core 2.67GHz Intel Xeon	12 GB	Media Composer 8.0 Media Composer 7.0.3 Media Composer 6.5	V4.7.4
HP z820	Red Hat Linux 6.2/6.3	8 Core 2.7 GHz Intel Xeon	16 GB	N/A	V4.7.4
HP z420	Windows 8.1 64-bit Windows 7 64-bit SP1	6 Core 3.20 GHz Intel Xeon	8 GB	Media Composer 8.0 Media Composer 7.0.3 Media Composer 6.5	V4.7.4
Lenovo S30	Windows 8.1 64-bit Windows 7 64-bit SP1	6 Core 3.20 GHz Intel Xeon	16 GB	Media Composer 8.0 Media Composer 7.0.3 Media Composer 6.5	V4.7.4
HP z400	Windows 8.1 64-bit Windows 7 64-bit SP1	6 Core 3.33GHz Intel Xeon	12 GB	Media Composer 8.0 Media Composer 7.0.3 Media Composer 6.5	V4.7.4
HP Z230*	Windows 8.1 64-bit Windows 7 64-bit SP1	4 Core E3-1245 v3 3.40 GHz Intel Xeon	8 GB	Media Composer 8.0 Media Composer 7.0.3	V4.7.4
Dell T-1700*	Windows 8.1 64-bit	4 Core E3-1245 v3 3.40 GHz Intel Xeon	8 GB	Media Composer 7.0.3	V4.7.4
Lenovo E32*	Windows 8.1 64-bit	4 Core E3-1245 v3 3.40 GHz Intel Xeon	8 GB	Media Composer 7.0.3	V4.7.4
HP Z220	Windows 7 64-bit SP1	4 Core E3-1245 3.40 GHz Intel Xeon	8 GB	Media Composer 8.0 Media Composer 7.0.3 Media Composer 6.5	V4.7.4
HP Z210	Windows 7 64-bit SP1	4 Core E31270 3.40 GHz Intel Xeon	4 GB	Media Composer 6.5	V4.7.4
HP 8570w	Windows 7 64-bit SP1	i7-3820QM 2.7 GHz	8 GB	Media Composer 7.0 Media Composer 6.5	V4.7.4
HP 8760w	Windows 7 64-bit SP1	4 Core 2.3 GHz Intel i7	4 GB	Media Composer 6.5	V4.7.4
Dell M6600	Windows 7 64-bit SP1	4 Core 2.20 GHz Intel i7	4 GB	Media Composer 6.5	V4.7.4
Mac Pro cylinder with Sonnet exp.	10.9 – 10.10	8 Core 3 GHz Intel Xeon E5	16 GB	Media Composer 8.3.1	V4.7.4
Mac Pro (Westmere)	10.7.4 – 10.9	2 X 2.6 GHz 6 Core Intel Xeon	12 GB	Media Composer 7.0 Media Composer 6.5	V4.7.4
Mac Pro (Westmere)	10.7.4 – 10.9	2 X 2.4 GHz Quad Core Intel Xeon	6 GB	Media Composer 7.0 Media Composer 6.5	V4.7.4
MacBook Pro 15"	10.7.4 – 10.9	2.3/2.6/2.7 GHz I7 quad core Retina & Thunderbolt	8 GB	Media Composer 6.5	V4.7.4
Mac Pro (Nehalem)	10.7.4 – 10.9	2 x 2.66 GHz Dual-Core Intel Xeon	6 GB	Media Composer 7.0 Media Composer 6.5	V4.7.4
iMac	10.7.4 – 10.9	3.6 GHz Intel Core i5	6 GB	Media Composer 7.0.3 Media Composer 6.5	V4.7.4

Capabilities and limitations for the individuals systems listed above can be found on Avid's Knowledge Base.

## 14.0 Performance Guidance Using More Than 12 Engines

ISIS 4.0 introduced support for expanding an ISIS 7000 configuration up to 24 Engines. This is accomplished by combining two ISIS stacks, also referred to as Management Domains, under one System Director (file system). A 24 crate configuration can be accomplished by combining two 12 Engine Management Domains. Since you cannot create Storage Groups that span the two Management Domains, any redistribution remains within each domain and the calculations adhere to what is published in the previous sections of this document.

The two stacks are interconnected via 10 Gb links (link aggregation) to the EXS switch. Each 10 Gb link can provide 600 MB/sec of bandwidth full duplex. This is the maximum bandwidth an ISS can support as noted in the Engine and Switch Performance section of this document. Each 4 X 10 Gb link aggregation group is capable of providing 2.4 GB/sec of bandwidth. In a 24 crate configuration there are 4 X 10 Gb links for each VLAN on each stack connected to the EXS. This allows you to achieve full stack bandwidth for each stack across the EXS if necessary, for example where all clients are connected to one stack, but are reading and/or writing data from/to the other. A 24 crate configuration is capable of providing 9.6 GB/sec of aggregate bandwidth, 4.8 GB/sec from each 12 Engine configuration. Diagram 1 gives a graphical representation of the EXS network topology.

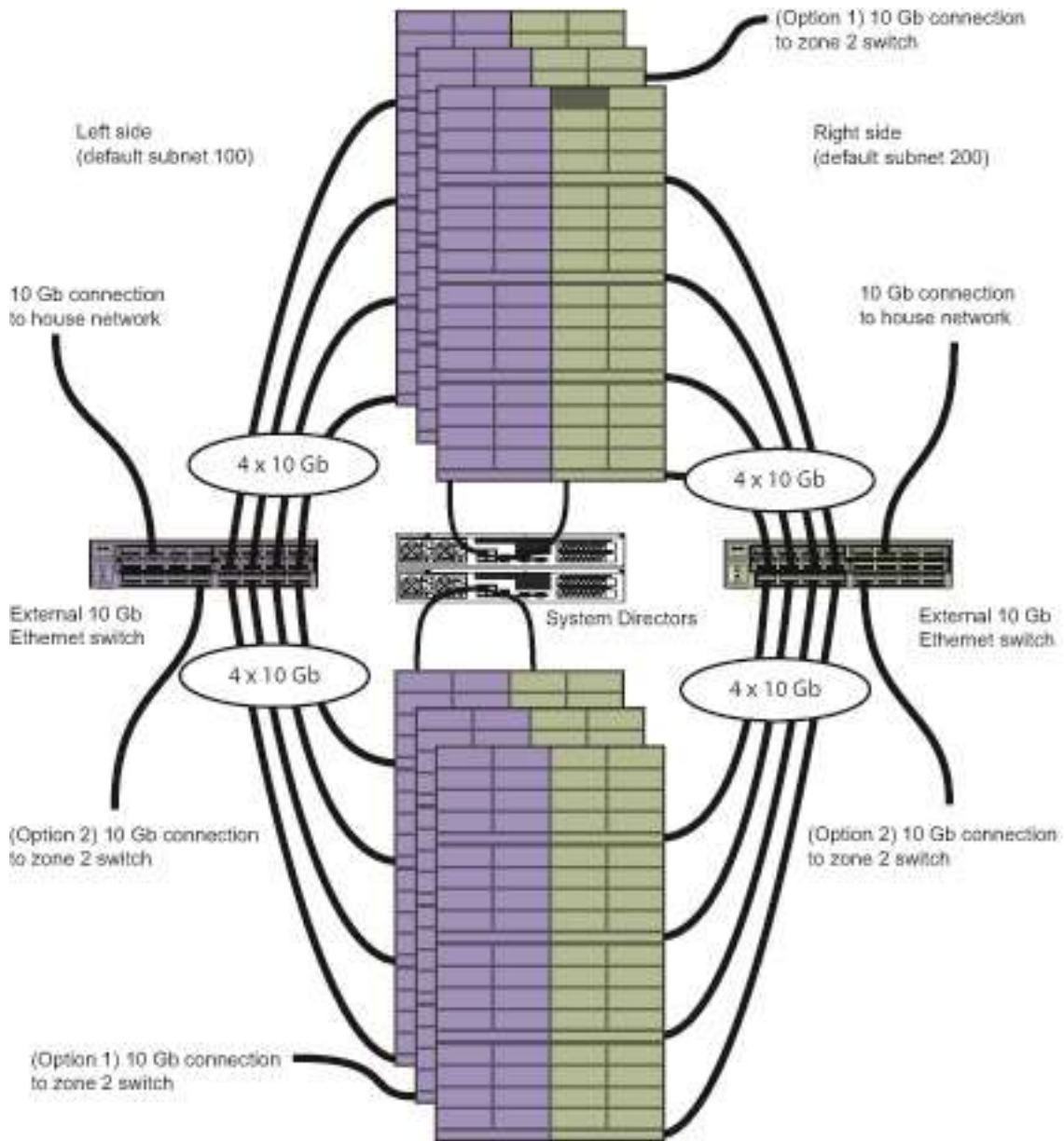
Use two External Expansion Switches (EXS) to build an ISIS that is greater than 12 engines. One EXS per VLAN interconnects each Management Domain. Each EXS is configured with 2 X 4 port groups of aggregated 10 Gb links. Each group connects to a VLAN on one of the Management Domains. For the sample configurations the first 8 ports of the EXS switch are used to build the 2 X 4 port groups. For the Dell Networking 4810, the ports are interface TenGigabitEthernet 0/0 through 0/7 while for the Cisco 4900 the ports are interface TenGigabitEthernet 1/1 through 1/8. See Diagram 1 for a pictorial representation on this configuration. See the following URL for sample EXS configuration files: <http://avid.custkb.com/avid/app/selfservice/search.jsp?ssdFilterCommunity15=1409&ssdFilterCommunity3=1450>



*You must still adhere to the engine/switch ratings published in this guide. Each EXS is limited to up to 20 X 1 Gb client connections and not more than 1 X 10 Gb client connections per 10 Gb link to a Management Domain. For example, if you have 4 EXS uplinks for a given VLAN in a Management Domain you are limited to four 10 Gb clients in that VLAN on the EXS.*

- △ If you plan to utilize 600 MB/sec of bandwidth on the links to the EXS (e.g., full stack bandwidth) then do not use the 1 Gb connections that are also serving as 10 Gb EXS uplinks as you would exceed per switch bandwidth. Plan your client bandwidth allocation carefully to avoid oversubscribing a segment of the network.
- △ For dual connected clients it is recommended that you split the connections between Management Domains in Zone 1 where possible, or split them between EXS switches in Zone 1.1.

**Diagram 1: 24 Crate Configuration EXS Topology**



### 14.1 Moving Workspaces between Stacks in configurations larger than 12 Engines

When working with a configuration that is larger than 12 Engines you may find that there are cases where you want, or need, to move Workspaces between stacks (Management Domain IDs) because you currently cannot create a Storage Group that spans those domains. This section is meant to offer guidance on approximately how long it will take to move the data. The speed at which that data can be moved depends on the number of Engines contained in that Storage Group, the number of 10 Gb links connecting the Domains to the EXS and the number of Engines contained in the receiving Storage Group. In ISIS 4.7 the Redistribution Monitor displays the overall progress of the redistribution as well as the aggregate rate at which the data is moving. A Workspace move is a form of redistribution.

As of the v2.4 release, Avid does not support any other bandwidth occurring when moving Workspaces between Domain IDs. This process must occur during non-production hours.

# of Engines Sending	# of Engines Receiving	# of 10 Gb links per VLAN to EXS	~Bandwidth	Time to move 1 TB (Minutes)
12	1	1	~300 MB/sec	56
1	12	1	~130 MB/sec	134
12	8	4	1.2 GB/sec	14
8	12	4	1.0 GB/sec	17

## 15.0 Tested Stream Counts with Apple Final Cut Pro

See section 10.1 of this document for support of 2K/4K/5K formats/codecs while using Final Cut Pro X. Avid has tested Final Cut Pro X as a client in the Avid ISIS shared storage environment. For supported versions, see the *Avid ISIS ReadMe*. There is no Avid restriction on the QuickTime version. Use the QuickTime version recommended in the Final Cut Pro application. The following provides information on how many streams were qualified per client at various resolutions.

Avid Interplay Access supports the Mac OSX platform, and through this application Final Cut Pro QuickTime files and projects can be checked into Interplay. Any Interplay workstation can search for these files and edit their Interplay metadata, though there is currently no tightly integrated workflow between Avid editors and Final Cut Pro within Interplay.

The following list characterizes the setup guidelines for your Final Cut Pro client with Avid ISIS 7500 - 7000:

- Follow the general client parameters specified for all Avid ISIS Macintosh clients.
- For Final Cut Pro X versions 10.2.1 and later, Libraries and Media can be stored on ISIS. For FCP X 10.1.2 - 10.1.4, it is recommended that you create and store libraries on the client's local hard drives, and store the media files and cache on the ISIS system. You can modify the Library Storage location settings in the Library Properties menu.
- Final Cut Pro editing software was characterized with the AJA KONA™3 hardware.
- Final Cut Pro Storage Groups can be configured to either operate using 256 KB or 512 KB chunk sizes.
- Final Cut Pro clients are supported in ISIS Zones 1, 2 and 3.
- The Avid ISIS Client Manager preference settings follow the same guidelines as for Avid editors. The default setting is set to Medium Resolution (limited to resolutions that draw 16 MB/s or less). Use the High Resolution setting when working with High Definition media (resolutions that draw higher than 16 MB/s). For data rate specifications, see the data in the following tables.
- Avid Pro Tools software was not tested with Final Cut Pro clients.

Scaling the Avid ISIS environment is based on the amount of bandwidth an ISIS engine (or several engines) is able to provide. A single ISIS engine is comprised of 16 storage blades and can produce upwards of 200 MB/s aggregate throughput, using a mirrored storage group, by serving multiple Final Cut Pro clients simultaneously.

Scaling an Avid ISIS beyond a single engine effectively scales in a linear fashion based on a single engine's performance. To calculate the rating for your ISIS system, use the following table to define an engine's capabilities based on the chunk size selected when creating a Storage Group and the resolutions in use.

The following configurations are not supported, due to performance degradation:

- △ Final Cut Pro and Media Composer running on the same Storage Group with Gen 1 switches
- △ Final Cut Pro and Media Composer running on the same RAID 6 Storage Group with Gen 2 switches

### 15.1 Engine Bandwidth Performance (MB/s) with Final Cut Pro

Avid ISIS shared storage and Avid editors are tuned to read and write optimal patterns to ISIS storage. Avid cannot control the read/write patterns of 3<sup>rd</sup> party editors (such as Final Cut Pro X). These editors often issue multiple small reads that require additional processing and seek operations that affect the performance of all the attached editors (Avid and 3<sup>rd</sup> party). Therefore the overall performance of ISIS is affected when mixing Avid and non-Avid editors.



Single Engine	Engine Switch Generation	Chunk Size	Storage Group	Engine Rating	Software Version
Final Cut Pro SD	ISS1000	256 KB	Mirrored	200	ISIS v4.5
Final Cut Pro ProRes SD and HD	ISS1000	256 KB	Mirrored	160	ISIS v4.5
Final Cut Pro SD	ISS2000	512 KB	Mirrored	200	ISIS v4.5
Final Cut Pro ProRes SD and HD	ISS2000	512 KB	Mirrored	160	ISIS v4.5
Final Cut Pro SD	ISS2000	512 KB	RAID 6	200	ISIS v4.5
Final Cut Pro ProRes SD and HD	ISS2000	512 KB	RAID 6	160	ISIS v4.5
Final Cut Pro and Media Composer SD and HD	ISS2000	512 KB	Mirrored	250	ISIS v4.5
Final Cut Pro SD and HD	ISS2000	512 KB	Mirrored	300	ISIS v4.5

The charts below define the bandwidth used per resolution and the recommended stream count for each. Attempting to increase the number of streams beyond what is shown may result in unexpected results for the Client, but should not affect the ISIS system.

Take the following into consideration when reading the following tables:

- All bandwidth ratings have been adjusted to include up to 8 tracks of 16 bit audio @ 48 KHz.
- For testing, we used a two minute sequence with two second audio and video cuts offset by one second.

#### Apple DVCPRO Resolutions on Mirrored Storage Groups

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
720*480	SD DVCPRO25 NTSC	8.72	13.84	19.42	25.30	30.43	36.76	30.7
720*576	SD DVCPRO25 PAL	8.56	12.16	16.91	21.60	27.76	33.27	30.1
720*480	SD DVCPRO50 NTSC	14.97	25.29	38.49	48.55	60.18	N/T	52.6
720*576	SD DVCPRO50 PAL	14.29	25.32	36.69	48.49	59.37	N/T	50.2

Legend

- N/T indicates not tested.

## Apple ProRes 422 Resolutions on Mirrored Storage Groups

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
1280*720	NQ 23.98	11	19	27	34	44	52	38.7
720*576	HQ PAL 25	11	19	28	34	44	52	38.7
1280*720	NQ 25	11	22	30	39	49	59	38.7
720*486	HQ NTSC 29.97	12	20	30	39	49	60	42.2
1280*720	HQ 23.98	16	32	47	62	77	N/T	56.3
1280*720	HQ 25	16	30	44	58	73	87	56.3
1920*1080	NQ 23.98	20	35	51	67	N/T	N/T	70.3
1920*1080	NQ 25	23	37	54	71	N/T	N/T	80.9
1280*720	NQ 50	23	41	57	78	N/T	N/T	80.9
1280*720	NQ 59.94	28	50	73	N/T	N/T	N/T	98.4
1920*1080	NQ 29.97	27	48	70	N/T	N/T	N/T	94.9
1920*1080	HQ 23.98	31	48	N/T	N/T	N/T	N/T	109
1280*720	HQ 50	32	58	N/T	N/T	N/T	N/T	112.5
1920*1080	HQ 25	32	60	N/T	N/T	N/T	N/T	112.5
1280*720	HQ 59.94	38	72	N/T	N/T	N/T	N/T	133.6
1920*1080	HQ 29.97	38	72	N/T	N/T	N/T	N/T	133.6

### Legend

- N/T indicates not tested.

## Apple ProRes 422 Resolutions While Playing Out on RAID Storage Groups

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
720*486	Proxy 30p	5.1	6.8	10	13	15.2	18.9	17.9
720*576	Proxy 25p	4.1	7.4	10.6	13.4	16	18.2	14.4
1280*720	Proxy 25p	5.4	9.8	15.4	18.9	22.3	26.1	19
720*576	LT 25p	7.1	11.9	16.9	23	29.8	36.3	25
720*486	LT 30p	6.6	11.9	18.2	23.9	27.5	35	23.2
1280*720	Proxy 50p	9.9	17.6	26	34.9	42.7	50.7	34.8
1920*1080	Proxy 25p	10.4	17.8	26.5	35	43.6	50.5	36.6
720*576	NQ 25	10	19.8	28.3	35.2	47.2	57.8	35.2
720*486	NQ 29.97	8.86	15.9	24.1	32.8	40.3	49.6	31.1
1920*1080	Proxy 30 p	11.1	19.8	31.3	40.5	59.4	66.9	39



RAID6 Storage Groups only support resolutions of 50 Mb and below.

## Uncompressed Resolutions on Mirrored Storage Groups

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
Uncompressed 8bit 4:2:2 SD	525i 23.98	23	44	65	84	104	N/T	81
Uncompressed 8bit 4:2:2 SD	625i 25	23	45	66	87	108	N/T	81
Uncompressed 8bit 4:2:2 SD	525i 29.97	26	54	76	101	N/T	N/T	91
Uncompressed 8bit 4:2:2 HD	1280x720p 23.98	48	93	N/T	N/T	N/T	N/T	169
Uncompressed 8bit 4:2:2 HD	1280x720p 25	50	96	N/T	N/T	N/T	N/T	176
Uncompressed 8bit 4:2:2 HD	1280x720p 29.97	57	114	N/T	N/T	N/T	N/T	200
Uncompressed 8bit 4:2:2 HD	1280x720p 50	92	N/T	N/T	N/T	N/T	N/T	323
Uncompressed 8bit 4:2:2 HD	1280x720p 59.94	114	N/T	N/T	N/T	N/T	N/T	401
Uncompressed 8bit 4:2:2 HD	1920x1080p 23.98	102	N/T	N/T	N/T	N/T	N/T	359
Uncompressed 8bit 4:2:2 HD	1920x1080p 25	104	N/T	N/T	N/T	N/T	N/T	366
Uncompressed 8bit 4:2:2 HD	1920x1080i 50	104	N/T	N/T	N/T	N/T	N/T	366
Uncompressed 10bit 4:2:2 SD	525i 23.98	26	49	72	N/T	N/T	N/T	91
Uncompressed 10bit 4:2:2 SD	625i 25	31	60	N/T	N/T	N/T	N/T	109
Uncompressed 10bit 4:2:2 SD	525i 29.97	32	61	N/T	N/T	N/T	N/T	113
Uncompressed 10bit 4:2:2 SD	1280x720p 23.98	62	N/T	N/T	N/T	N/T	N/T	218
Uncompressed 10bit 4:2:2 SD	1280x720p 25	64	N/T	N/T	N/T	N/T	N/T	225
Uncompressed 10bit 4:2:2 SD	1280x720p 29.97	76	N/T	N/T	N/T	N/T	N/T	267

## 15.2 Final Cut Pro Editor Hardware and Software Used During Testing

The following chart describes the Final Cut Pro and Avid hardware and software used during testing in an all Final Cut Pro environment and in a mixed environment.

Platform	OS	CPU	Memory	Editor Version	ISIS Client
Mac Pro	10.9.x	2 x 2.66GHz Quad-Core Intel Xeon (Nehalem)	16GB	Media Composer v7.0.x Media Composer v8.x	v4.7.4
Mac Pro	10.9.x	2 x 2.4 GHz Quad-Core Intel Xeon Mid 2010	16GB	Final Cut Pro X	v4.7.4
Mac Pro	10.9.x	2 x 2.66GHz Quad-Core Intel Xeon (Nehalem)	16GB	Media Composer v7.0.x Media Composer v8.x	v4.7.4
Mac Pro	10.9.x	2 x 2.26 GHz Quad-Core Intel Xeon Early 2009	16GB	Final Cut Pro X	v4.7.4
HP Z400	Windows 8	6 Core 3.03GHz Intel Xeon	12GB	Media Composer v7.0.x	v4.7.4

## 16.0 Engine Bandwidth Performance (MB/s) with Adobe Premiere Clients

See section 10.1 of this document for support of 2K/4K/5K formats/codecs while using Adobe Premiere Pro CC v8. Avid has tested Adobe Premiere Pro CC v8 in the Avid ISIS 7000 shared storage environment using Adobe Premiere Pro CC v8, Media Composer v7.0 and v8.0, with an Avid ISIS v4.7 client software in an ISIS v4.7 infrastructure.

The following are guidelines used with Adobe Premiere clients on Avid ISIS 7000:

- Adobe Premiere 10 Gb clients are now supported on ISIS 7000.
- Media from both Adobe Premiere and Avid Media Composer are able to co-exist in the same storage group. For optimal performance, do not mix Avid editors and Premiere editors in the same Storage Group.
- Adobe Premiere was qualified on Windows 7 64-bit SP1 and Mac OS v10.9 and 10.10.x 64-bit operating systems.
- Adobe Premiere clients follow the same guidelines as for Avid editors in regards to the Avid ISIS Client Manager Preference settings. The default setting is set to Medium Resolution (limited to resolutions that draw 16 MB/s or less). Use the High Resolution setting when working with High Definition media (resolutions that draw higher than 16 MB/s). There are some HD resolutions that draw less than 16 MB/s for a single stream, but you should still use the High Resolution setting (for example, XDCAMHD 50). For data rate specifications, see the data in the following tables.

The following tables illustrate the engine ratings in an all Adobe Premiere storage group as well as an environment with Adobe Premiere and Avid editors used together in the same storage group. Scaling an Avid ISIS 7000 beyond a single engine effectively scales in a linear fashion based on a single engine's performance.

### Adobe Premiere Only

# of Engines	All Reads	All Writes	Aggregate
Available B/W per Engine	400 MB/s	200 MB/s	400 Note: You must multiply write bandwidth by 2 for mirrored protection and 2.2 for RAID6 protection. The Performance Monitor in the ISIS Management Console will not show this additional load.

### Adobe Premiere and Avid Editors in a Mixed Environment

# of Engines	All Reads	All Writes	Aggregate
Available B/W per engine	400 MB/s	200 MB/s	400 Note: You must multiply write bandwidth by 2 for mirrored protection and 2.2 for RAID6 protection. The Performance Monitor in the ISIS Management Console will not show this additional load. MB/s

The following provides information on how many streams were qualified per client at various resolutions. These tables define the bandwidth used per resolution and the recommended stream count for each. Attempting to increase the number of streams beyond what is shown may result in unexpected results for the Client, but should not affect the ISIS system.

Take the following into consideration when reading the tables included in this section:

- All bandwidth ratings have been adjusted to include up to 8 tracks audio
- Data in this document was obtained using the Adobe Premiere Creative Cloud v8 editing application.
- All bandwidth ratings have been adjusted to include up to 8 tracks of 16 bit audio @ 48 KHz. The sequence used for testing has two second audio and video cuts offset by one second.

**\*Playback Only**

**DVC Pro SD (Windows 7/8 x64 and Mac OS 10.9.x)**

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
SD DVC Pro50 720*480	NTSC 29.97	11	21	33	43	54	64	35.2
SD DVC Pro50 720*576	PAL 25	10	21	31	41	51	61	35.2

Legend

- Gray cells indicate 2 X 1 Gb

**720p (Windows 7/8 x64 and Mac OS 10.9.x)**

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
DVCPROHD 960*720 23.976	720p/24	10	18	27	36	45	54	35
DVCPROHD 960*720 50	720p/50	18	37	56	76	96	114	59.8
DVCPROHD 960*720 59.94	720p/60	18	35	54	72	89	103	59.8

Legend

- Gray cells indicate 2 X 1 Gb

**720p (Mac OS 10.9.x)**

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
AVC-Intra 50 960*720 23.976	720p/24	7	13	18	26	32	38	25
AVC-Intra 50 960*720 25	720p/25	6	14	20	27	33	40	21.1
AVC-Intra 50 960*720 29.97	720p/30	7	13	20	26	32	39	25
AVC-Intra 50 960*720 50	720p/50	10	19	N/T	N/T	N/T	N/T	35.2
AVC-Intra 50 960*720 59.94	720p/60	12	20	31	N/T	N/T	N/T	42.2
AVC-Intra 100 1280*720 23.976	720p/24	10	19	28	38	48	59	35
AVC-Intra 100 1280*720 25	720p/25	11	23	34	43	58	69	35.2
AVC-Intra 100 1280*720 29.97	720p/30	10	21	32	41	55	N/T	35.2
AVC-Intra 100 1280*720 50	720p/50	18	N/T	N/T	N/T	N/T	N/T	59.8

Legend

- N/T indicates not tested

**720p (Windows 7/8 x64)**

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
AVC-Intra 50 960*720 23.976	720p/24	6	8	11	14	16	19	21.1
AVC-Intra 50 960*720 25	720p/25	6	10	13	16	20	23	21.1
AVC-Intra 50 960*720 29.97	720p/30	6	10	13	16	20	23	21.1
AVC-Intra 50 960*720 50	720p/50	18	N/T	N/T	N/T	N/T	N/T	63.28
AVC-Intra 50 960*720 59.94	720p/60	12	N/T	N/T	N/T	N/T	N/T	42.19
AVC-Intra 100 1280*720 23.976	720p/24	8	14	19	25	30	36	28.1
AVC-Intra 100 1280*720 25	720p/25	10	17	23	30	37	44	35.2
AVC-Intra 100 1280*720 29.97	720p/30	10	17	23	30	37	N/T	35.2
AVC-Intra 100 1280*720 50	720p/50	17	N/T	N/T	N/T	N/T	N/T	59.8
AVC-Intra 100 1280*720 59.94	720p/60	18	N/T	N/T	N/T	N/T	N/T	59.8

Legend

- N/T indicates not tested

### 1080i (Mac OS 10.9.x)

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
DVC Pro HD 1440*1080 25	1080i/50	26	54	82	110	135	162	91.41
DVC Pro HD 1280*1080 29.97	1080i/60	18	35	55	74	94	113	59.8

Legend

- Gray cells indicate 2 X 1 Gb

### 1080i (Windows 7/8 x64)

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
1:1 10 bit*	1080i/59.94	150	N/T	N/T	N/T	N/T	N/T	527
1:1 8 bit*	1080i/59.94	125	N/T	N/T	N/T	N/T	N/T	439
DVC Pro HD 1440*1080 25	1080i/50	26	52	N/T	N/T	N/T	N/T	91.41
DVC Pro HD 1280*1080 29.97	1080i/60	18	35	54	70	88	N/T	59.8

\*Playback only

Legend

- N/T indicates not tested
- Gray cells indicate 2 X 1 Gb
- Orange cells indicate 10 Gb connectivity required

### 1080p (Mac OS 10.9.x)

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
AVC-Intra 50 1440*1080 23.976	1080p/24	9	19	27	39	N/T	N/T	31.6
AVC-Intra 50 1440*1080 25	1080p/25	11	19	32	42	58	N/T	38.7
AVC-Intra 50 1440*1080 29.97	1080p/30	11	18	30	41	N/T	N/T	38.7
AVC-Intra 100 1920*1080 23.976	1080p/24	16	30	40	N/T	N/T	N/T	56.3
AVC-Intra 100 1920*1080 25	1080p/25	27	50	N/T	N/T	N/T	N/T	94.9
AVC-Intra 100 1920*1080 29.97	1080p/30	19	30	N/T	N/T	N/T	N/T	66.8
AVC-Intra 50 1440*1080 23.976	1080p/24	9	19	27	39	N/T	N/T	31.6

Legend

- N/T indicates not tested

### 1080p (Windows 7/8 x64)

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
AVC-Intra 50 1440*1080 23.976	1080p/24	8	14	N/T	N/T	N/T	N/T	28.1
AVC-Intra 50 1440*1080 25	1080p/25	12	22	N/T	N/T	N/T	N/T	42.19
AVC-Intra 50 1440*1080 29.97	1080p/30	11	N/T	N/T	N/T	N/T	N/T	35.2
AVC-Intra 100 1920*1080 23.976	1080p/24	14	25	36	N/T	N/T	N/T	49.2
AVC-Intra 100 1920*1080 25	1080p/25	N/T	N/T	N/T	N/T	N/T	N/T	59.8
AVC-Intra 100 1920*1080 29.97	1080p/30	18	N/T	N/T	N/T	N/T	N/T	59.8

Legend

- N/T indicates not tested

### XDCAM HD422 (Windows 7/8 x64 and Mac OS 10.9.x)

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
XDCAM HD422 CBR_25	1080i/50	16	25	38	41	51	62	56.25
XDCAM HD422 CBR_29.97	1080i/60	17	28	36	47	55	64	59.77
XDCAM HD422 CBR_23.98	1080p/24	11	19	25	33	39	45	35.2
XDCAM HD422 CBR_25	1080p/25	16	25	32	42	53	61	56.25
XDCAM HD422 CBR_29.97	1080p/30	20	28	35	47	53	68	70.31
XDCAM HD422 CBR_50	720p/50	21)	32	42	52	59	N/T	73.83
XDCAM HD422 CBR_59.94	720p/60	30	39	53	70	N/T	N/T	105.47

Legend

- N/T indicates not tested
- Gray cells indicate 2 X 1 Gb

### Apple ProRes (Mac OS 10.9.x)

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
ProRes 422 HQ	1080p/24	28	56	85	N/T	N/T	N/T	98.4
ProRes 422 HQ	1080p/25	46	80	N/T	N/T	N/T	N/T	161.7
ProRes 422 HQ	1080p/30	34	68	104	N/T	N/T	N/T	119.5
ProRes 422 HQ	1080p/50	56	N/T	N/T	N/T	N/T	N/T	196.9
ProRes 422 HQ	1080p/59.94	65	N/T	N/T	N/T	N/T	N/T	228.5
ProRes 422 HQ	720x486p29.97	13	26	39	52	65	N/T	45.7
ProRes 422 HQ	720p24	17	32	48	64	80	N/T	59.8
ProRes 422 HQ	720p50	30	60	89	N/T	N/T	N/T	105.5
ProRes 4444	1080p30	50	N/T	N/T	N/T	N/T	N/T	175.8
ProRes 422 720p59.94	720p59.94	25	49	72	N/T	N/T	N/T	87.9
ProRes 422	1080p25	30	59	89	N/T	N/T	N/T	105.5
ProRes 422 LT	1080p50	26	52	79	N/T	N/T	N/T	91.4
ProRes 422 Proxy	1080p50	13	27	41	55	68	N/T	45.7

Legend

- N/T indicates not tested
- Gray cells indicate 2 X 1 Gb

### Apple ProRes (Windows 7/8 x64)

Resolution	Project Format	Number of Streams per client (MB/s)						GB/Hr
		1	2	3	4	5	6	
ProRes 422 HQ	1080p/24	33	N/T	N/T	N/T	N/T	N/T	116
ProRes 422 HQ	1080p/25	45	N/T	N/T	N/T	N/T	N/T	158.2
ProRes 422 HQ	1080p/30	41	N/T	N/T	N/T	N/T	N/T	144.1
ProRes 422 HQ	720x486p29.97	11	22	33	44	54	64	38.7
ProRes 422 HQ	720p24	14	28	42	54	67	N/T	49.2
ProRes 422 HQ	720p50	26	52	N/T	N/T	N/T	N/T	91.4
ProRes 422 720p59.94	720p59.94	20	41	63	N/T	N/T	N/T	70.3
ProRes 422	1080p25	27	N/T	N/T	N/T	N/T	N/T	94.9
ProRes 422 LT	1080p50	22	44	68	N/T	N/T	N/T	77.3
ProRes 422 Proxy	1080p50	12	25	37	49	N/T	N/T	42.2

Legend

- N/T indicates not tested
- Gray cells indicate 2 X 1 Gb

## 16.1 Adobe Premiere Hardware and Software Used During Testing

The following chart describes the Adobe Premiere and Avid hardware and software used during testing in a complete Adobe Premiere environment and in a mixed environment.

Platform	OS	CPU	Memory	Editor Version	ISIS Client
HP z820	Windows 7 64-bit SP1 Windows 8	8 Core 2.7 GHz Intel Xeon	12GB	Adobe Premiere CC v8	v4.7.4
Mac Pro	10.9.x	2 x 2.66GHz Quad-Core Intel Xeon (Nehalem)	12GB	Adobe Premiere CC v8	v4.7.4