



# DIGITAL CINEMA DTD WORKFLOW

ALBERTO FARINAS

# INSPIRATION

- + Students are constantly haunted by many doubts during the shooting process. Am I getting the shot? Are there breaks in continuity? Is the lighting going to hold up through the inevitable compression?
- + Did my footage safely transfer into the P2 store? Are there any corrupted shots? Am I sure I transferred all my files off the P2?
- + Do I really need to digitize all this footage in real-time? Is this tiny LCD faithfully showing what I'm capturing?



# OVERVIEW OF PROJECT

Introduction

# PURPOSE

- + Current RIT approach to shooting video is predicated in constant uncertainty.
- + This project basically strives to introduce the power of computing into the acquisition process.
- + Introduces a tapeless/p2-less digital workflow eliminating any dark spots in the acquisition process where there is uncertainty.
- + By introducing the use of powerful direct to disk recording and monitoring software, this project will help students shoot better, smarter, and with more confidence.
- + This workflow has to be applicable to any digital video production whether HD or SD

# DIGITAL DTD WORKFLOW

CAMERAS

HD or SD VIDEO  
STREAM THROUGH  
1394 Firewire port

SOFTWARE

ONLOCATION  
CONDUIT LIVE  
SCOPEBOX

HARDWARE  
OPERATING  
SYSTEM

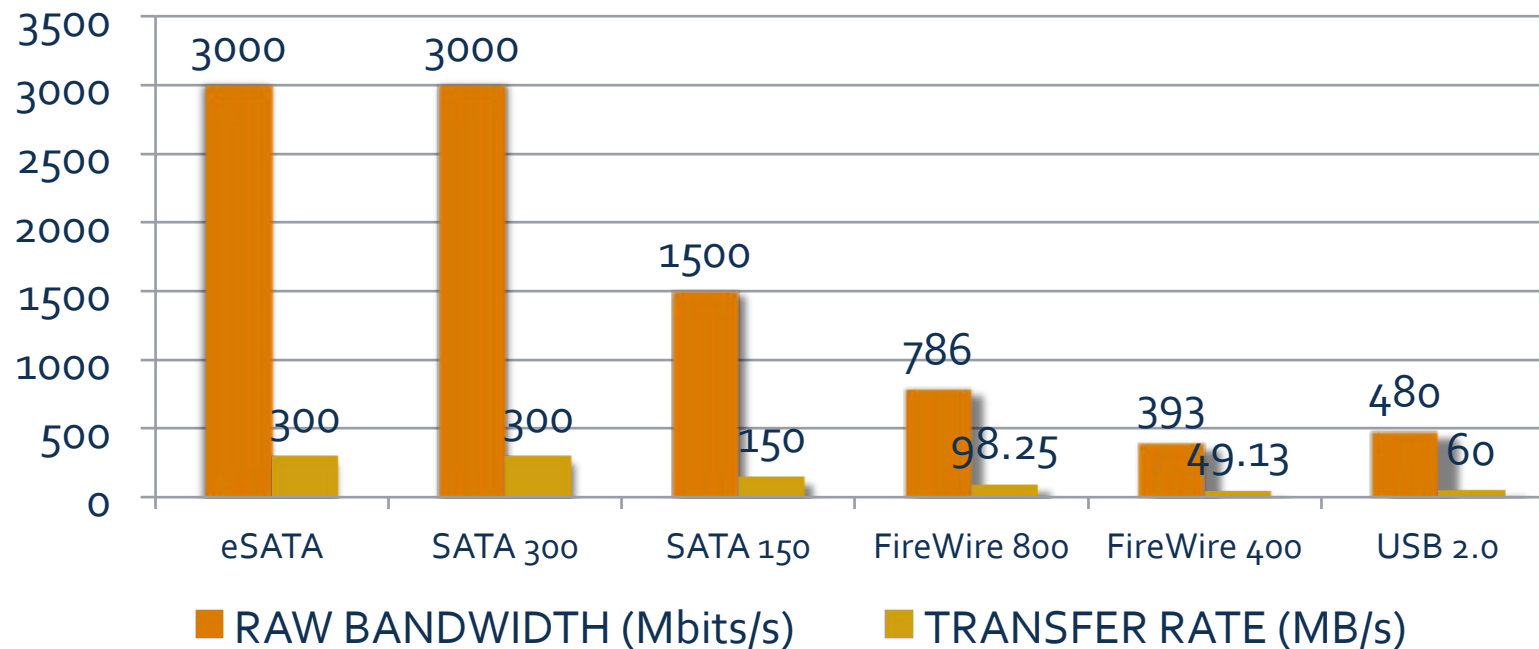
MAC OS

WINDOWS PC

# DIGITAL DTD WORKFLOW



# COMMON HDD INTERFACES FOR HD VIDEO CAPTURE



Speed at which data can be transferred through the medium.

Amount of data that is allowed to send back and forth in a given time.

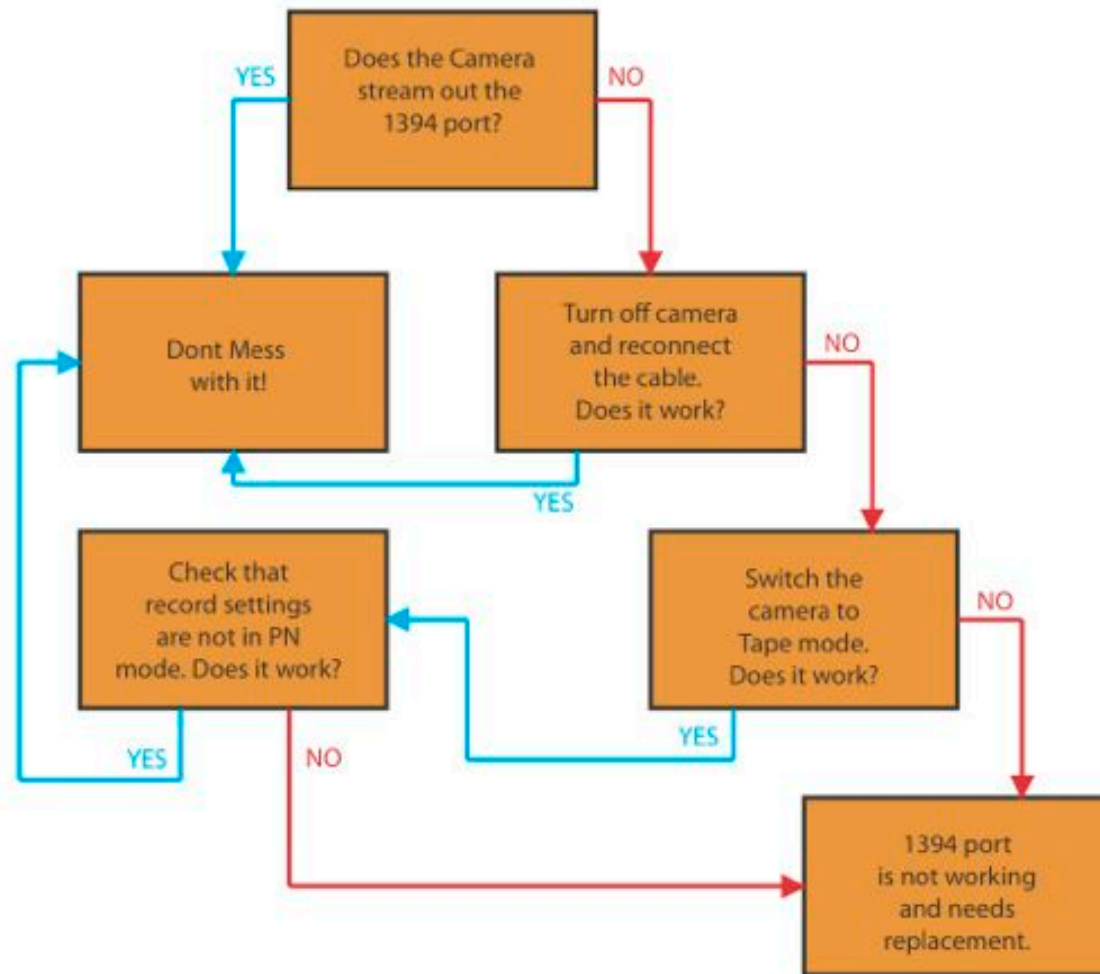
# IEEE 1394 PORT LIMITATIONS

MAX DATA RATE (MB/sec)	MAX LENGTH (ft)
MAX DATA RATE (MB/sec)	49.152
MAX DATA RATE (Mbits/sec)	393.216
MAX CABLE LENGTH (ft)	14.8

- + DVCPPro HD video stream is roughly around 100 Mbits/sec
- + The 1394 protocol can support this data rate with its 393.216 Mbits/sec data transfer rate.



# 1394 PORT FUNCTIONALITY TEST



# WORKING HVX200 CAMERAS

HVX KIT	STATUS
1	1394 port: working Firmware: 4.06.0
2	1394 port: not working Firmware: 4.06.0
3	1394 port: working Firmware: 4.06.0
4	1394 port: not working Firmware: 4.06.0
5	1394 port: working Firmware: 4.07.0
6	1394 port: working Firmware: 4.07.0
7	1394 port: working Firmware: 4.07.0
8	1394 port: working Firmware: 4.07.0



# DIRECT TO DISK SOFTWARE

DTD

# DTD RECORDING SOFTWARE

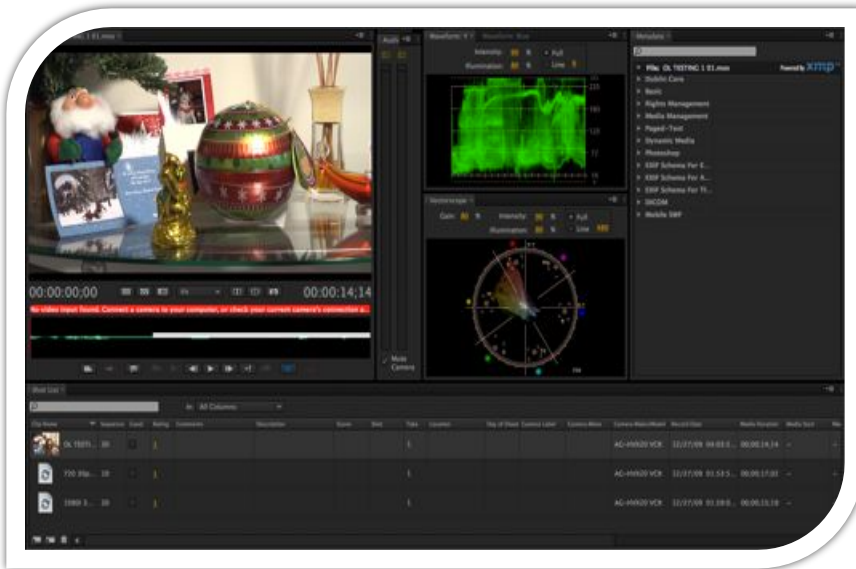
+ Adobe Onlocation CS3 CS4

+ Conduit Live

+ ScopeBox

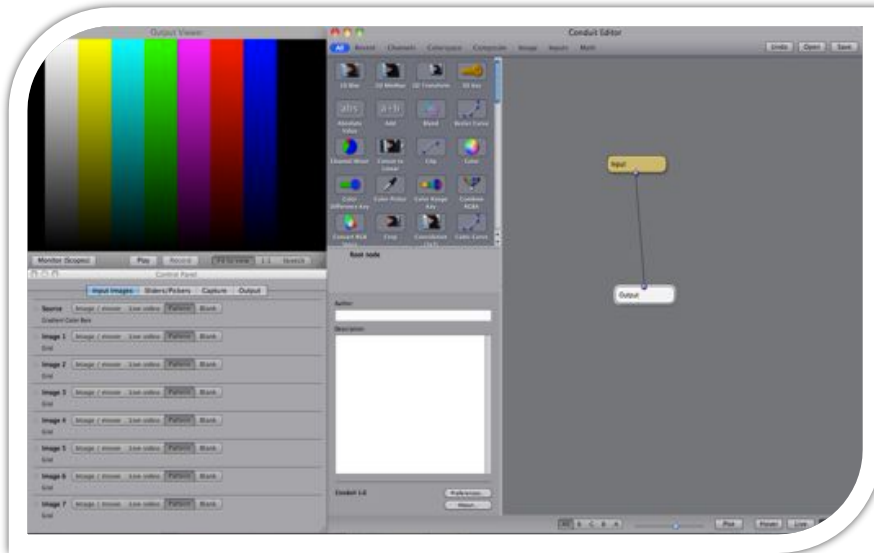


# ADOBE ONLOCATION



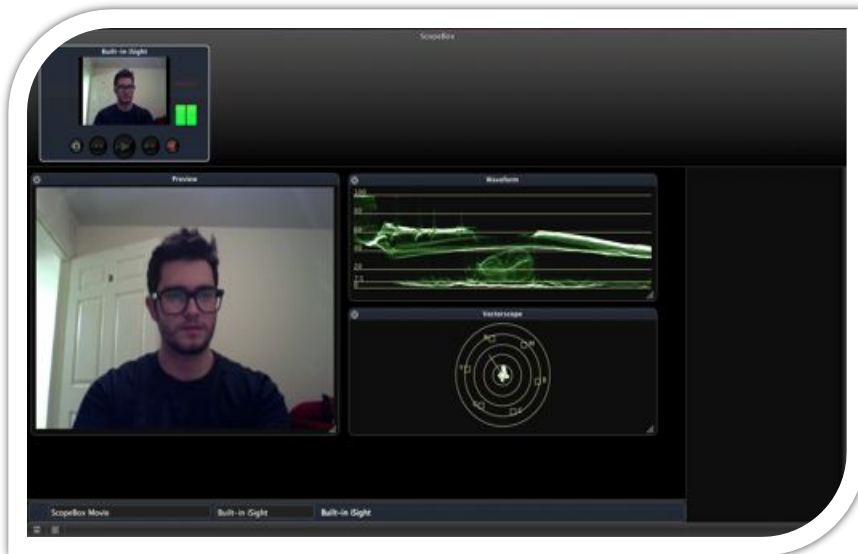
- + Direct to disk recording through 1394 port.
- + Live monitoring during recording.
- + Scopes and waveform monitors.
- + Instantly rename clips
- + Direct playback of clips on set with no rendering or converting process.
- + Skips P2 .MXF wrapper.

# CONDUIT LIVE



- + Live compositing and effects.
- + Live Color correction.
- + Multiple video inputs.
- + Multiple hi-res outputs.
- + Friendly node-based software.

# SCOPEBOX



- + Scopes and Monitors.
- + Multiple camera inputs
- + Limited to Mac platform
- + Clean simple interface.
- + Easily rename captured clips.

# BREAKING THE WORKFLOW

## Recording Experiments

- + Experiment 1 was designed to determine Hard Drive speed and transfer rate that will not support real-time HD recording to disk.
- + Experiment 2 was designed to determine computer processing power threshold for smooth monitoring while recording to disk.
- + Experiment 3 was designed to determine compatibility of the footage from these software with the rest of the post production pipeline.





# DTD RECORDING TEST

Experiment 1

# DTD RECORDING TEST

## Overview

- + Two HDD's were used to test the software's ability to record faithfully given slow hard drive speed limitations.
- + The Hitachi is meant to represent a slow HDD because it is much older, has slower access time, and spins at a slower speed.
- + The Samsung is an external HDD and is meant to represent a modern faster HDD most commonly used today.
- + Both HDD's underwent the recording of an HD stream from a Panasonic HVX 200A in both a 720p and 1080i resolution.

# DTD RECORDING TEST

## Hard Drives

**Hitachi DK23FA-40**

**(old)**



**Samsung MPO402H**

**(modern)**



# DTD RECORDING TEST

## Hitachi Internal Drive



- + ATA-6 Interface
- + 4,200 RPM
- + Max Media Transfer Rate of 43.9 MB/sec
- + Max Interface Transfer Rate of 100 MB/sec

# DTD RECORDING TEST

## Samsung External Drive

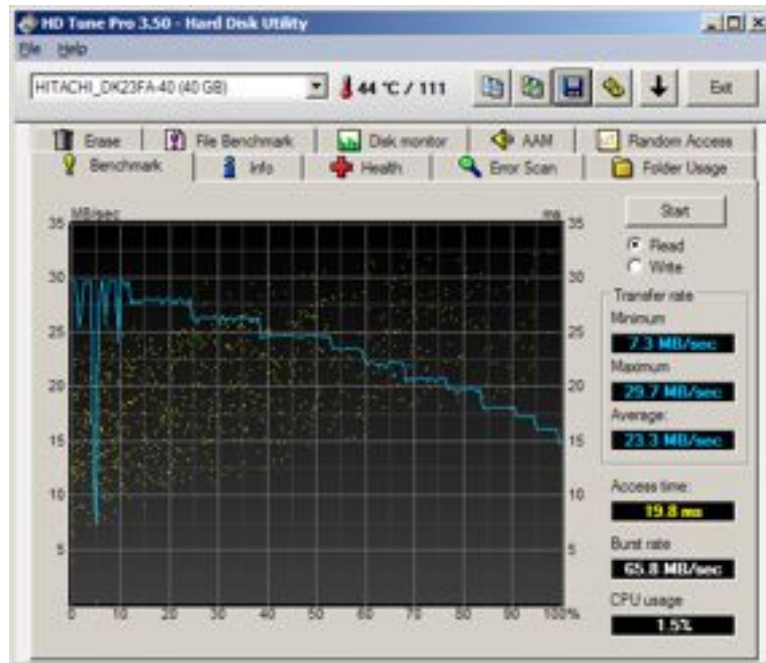


- + USB 2.0 interface
- + 5,400 RPM
- + RMS Interface Transfer Rate of 60 MB/sec
- + Avg. Access Time of 5.6 ms

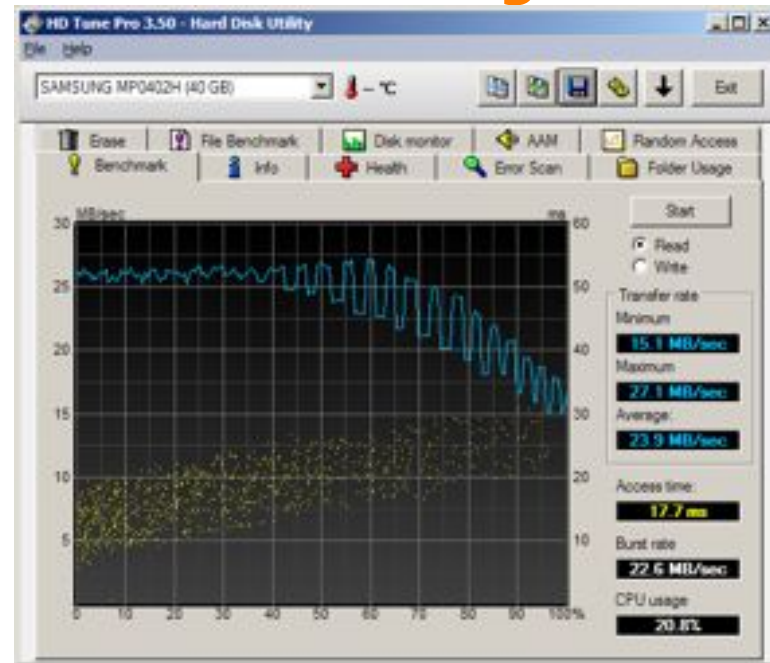
# DTD RECORDING TEST

## HDD Transfer Rate Check

### Hitachi



### Samsung



HD Tune Pro was used to analyze the HDD. It is a Hard Disk Utility that will plot Read and Write speeds of any HDD connected to it.

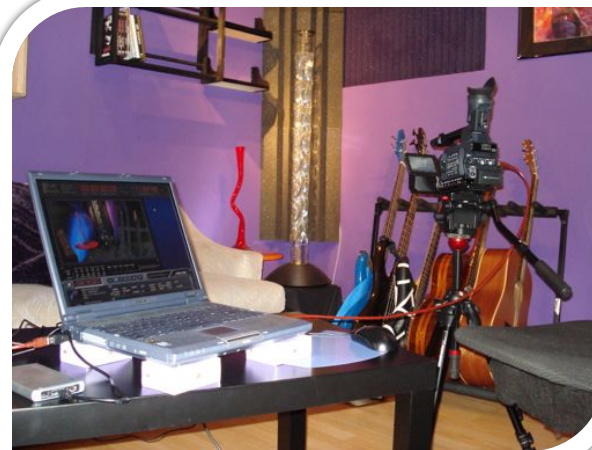
# DTD RECORDING TEST

## Conclusions

- + Software will prioritize recording over smooth monitoring and in both 720p & 1080i resolutions, the HD video stream was recorded with zero dropped frames.
- + The Sony Vaio lacked the processing power to achieve recording and monitoring of the video stream in real-time but when the captured footage was then taken to a more powerful computer, the clips played back flawlessly.
- + In any event, faithful recording of the stream will be guaranteed even with today's oldest laptops not to mention any new laptop sold today.
- + Playback of the stream while recording is directly related to processing capabilities of the computer and this processing power threshold is determined in another experiment.

# DTD RECORDING TEST

## Visual Documentation







# PROCESSING POWER TEST

Experiment 2

# PROCESSING POWER THRESHOLD

## Overview

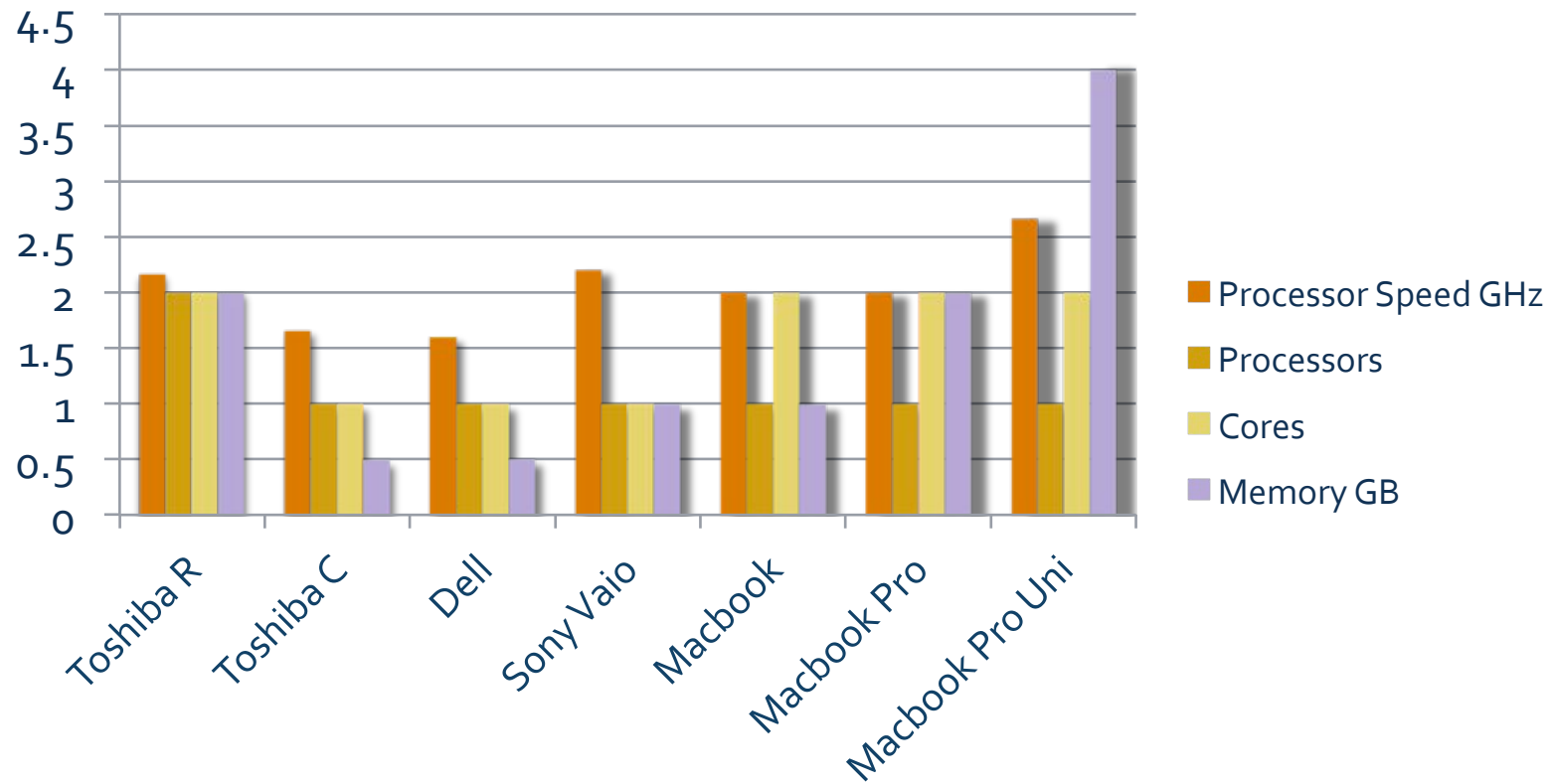
- + This experiment was an attempt to find the threshold processing power requirements that guarantees smooth monitoring of the HD video stream while recording to disk.
- + 7 different laptops in both platforms running Adobe Onlocation CS3 & Cs4 were used.
- + First test was to check if the processing power of each laptop could playback (decode) a 720p & 1080i video clip.
- + The second was to verify smooth monitoring while recording a 720p & 1080i video stream to their internal hard drives.

# PROCESSING POWER THRESHOLD

## Laptop Specifications

MODEL NAME	Processor Speed GHz	Number of Processors	Number of Cores	Memory GB
MacBook Pro Unibody	2.66	1.0	2.0	4.0
MacBook Pro	2.0	1.0	2.0	2.0
MacBook	2.0	1.0	2.0	1.0
Sony Vaio	2.2	1.0	1.0	1.0
Dell	1.6	1.0	1.0	.512
Toshiba C	1.66	1.0	1.0	.504
Toshiba R	2.16	2.0	2.0	2.0

# PROCESSING POWER THRESHOLD Plotted



# PROCESSING POWER THRESHOLD

## HD Playback

Computers	720p	1080p	Comments
MacBook Pro Uni	G	G	Quicktime decodes inefficiently. VLC plays back flawlessly.
MacBook Pro	G	G	Quicktime on Mac introduced artifacts during playback.
MacBook	G	M	Needed an Updated Quicktime.
Sony Vaio	F	F	Not able to decode a single frame.
Dell	G	F	Plays back 1080p with wrong aspect ratio.
Toshiba C	G	M	Playback of 1080p video is jittery.
Toshiba R	G	M	Playback of 1080p is in slow motion.

G=Good M=Manageable F=Failed

# PROCESSING POWER THRESHOLD

## Monitoring Observations

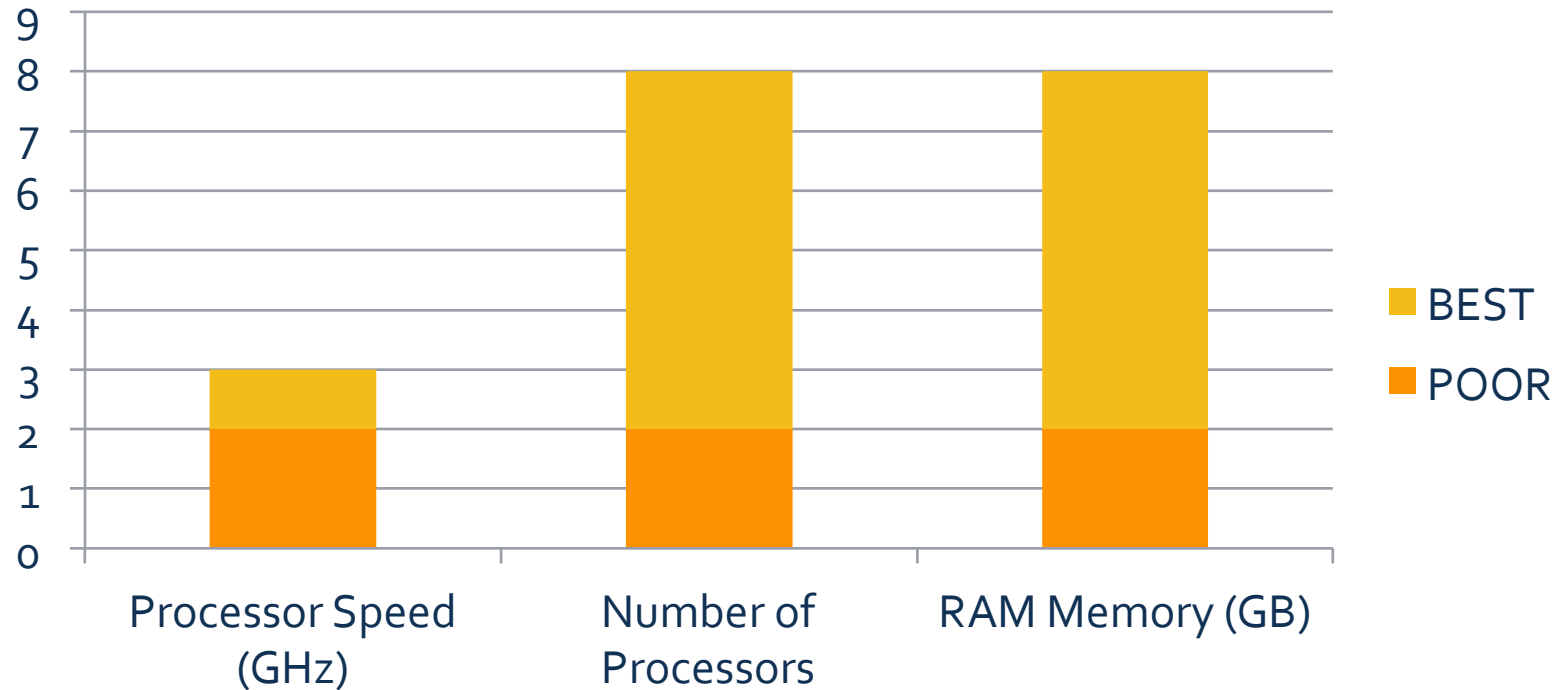
Computers	720p	1080p	Comments
MacBook Pro Uni	G	G	Smooth monitoring.
MacBook Pro	G	G	Smooth monitoring.
MacBook	G	M	1080i stutters a bit while recording.
Sony Vaio	M	F	720p stream jitters and 1080i doesn't move.
Dell	G	F	No monitoring of 1080i stream.
ToshibaC	M	M	Playback of 720p & 1080i video is jittery.
Toshiba R	G	G	Smooth monitoring.

G=Good M=Manageable F=Failed

# PROCESSING POWER THRESHOLD

## Conclusions

### Computer Requirements



# PROCESSING POWER THRESHOLD

## Visual Documentation







# COMPATIBILITY TEST

Experiment 3 - ScopeBox and OnLocation

# FOOTAGE COMPATIBILITY TEST

## Incorporating FCP & Color

- + The purpose of this test was to see how well the HVX 200 footage behaved throughout the entire post-production pipeline.
- + Both 720p & 1080i footage was captured using both Onlocation and Scopebox.
- + Then footage was played back using Quicktime Pro 10.0, Quicktime 7.0, and VLC.
- + Ingested into FCP, sent to color rendered in color and sent back to FCP to then be exported.

# FOOTAGE COMPATIBILITY TEST

## Results

✓ = works ✗ = Doesn't work

DTD Software	Software	720p	1080i
SCOPEBOX WORKFLOW	Scopebox	✓	✗
	Quicktime 7	✓	✓
	Quicktime 10.0	✓	✗
	VLC	✗	✗
	Final Cut Pro	✓	✓
	Color	✓	✓
ONLOCATION WORKFLOW	OnLocation	✓	✓
	Quicktime 7	✓	✓
	Quicktime 10.0	✗	✗
	VLC	✓	✓
	Final Cut Pro	✓	✓
	Color	✓	✓

# APPLICATION TO DIFFERENT PRODUCTION GENRES

Workflow Boundaries



# APPLICABLE GENRES

## Overview

- + Being tethered to a laptop is not useful for every type of production.
- + Run and Gun type of productions require freedom to move camera without limitations
- + Weather conditions will also require less damageable and risky gear on set.
- + This workflow is meant to be used during controlled productions where there are pre-planned camera positions in controlled environments.

# GREEN SCREEN COMPOSITING



- + RGB tools let you see how much green you have in your framing.
- + Waveform will let you see how even your green screen is and also where to adjust your lights.
- + Conduit will let you live key the object to get a pre-visualization of how the comp will turn out.

# INTERVIEWS AND DOCUMENTARY



- + This workflow is best used for controlled productions.
- + Having the tools available to you makes setting up easier and faster when you know how your lights are being captured.
- + Make every take a good take.

# MOVIE PRODUCTION



- + Studio or Location fixed setup
- + Rehearsed production
- + Scripted shot list and story.
- + Single camera production.
- + Dedicated crew member as DIT



# WEBSITE WORKFLOW GUIDE

## DIRECT TO DISK RECORDING WORKFLOW

Digital Imaging Technician | Direct to Disk Recording | 3D-HD Workflow | System Test Downloads



Rochester Institute of Technology Alberto Ferris