

13 July 2015

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Subject: Design Qualifications
Project: Board Room A/V Upgrade
RGDL #: 13-024

Dear Sudhnshu:

You asked us to provide an explanation of why the migration to a new digital video system is a significant benefit of the proposed AV system as well as how those with disabilities will benefit from the system. This letter summarizes our thoughts.

I. Benefits of Migration from Analog Video to Digital Video Systems

A. Signal Integrity and source compatibility

The use of analog-based video presentation systems has declined over the last 10 years with the successful implementation of the High Definition Multimedia Interface (HDMI) connector in 2003. Since that time, there has been a steady migration from analog based video distribution and display systems due to the improvements offered by an all digital system. Specific reasons that digital video (HDMI, DVI-D, DisplayPort, Mini DisplayPort) signals have been replacing legacy analog (VGA, component, S-video, composite video) signals include:

- Digital video signals are capable of displaying at a higher resolution than analog signals with currently available hardware
- Digital video signals can share source and display resolution tables for optimizing the display output resolution and switching time of the displayed source
- Digital distribution and presentation systems are more compatible with the growing number of digital-only source output devices

The push from analog to digital based video systems is evident in the audiovisual component manufacturing world. For example, as of 2013, AMD and Intel, have announced that they will no longer produce laptop PC chipsets with an analog video output. This means that all laptops made after 2013 will only have digital video outputs. Additionally, virtually all

new personal video devices (e.g. tablets, video players, and smartphones) are only capable of outputting a digital video signal.

In order to display digital-based signals on an analog-based distribution system (such as the system that currently exists at the SCVWD), the digital signal needs to be converted to an appropriate analog format. In the SCVWD boardroom, there is already a conversion from digital to analog video that is handled with a digital to analog convertor. However, moving forward there are a number of video sources in the Boardroom that originate from computers, tablets, smartphones, and video players that will output digital video only. As a result, digital to analog convertors will be required for each of these sources for distribution and presentation on an analog- based system such as that in the Boardroom.

The push towards digital video systems has also come from content creators since digital video sources and components have the ability to display High Bandwidth Digital Content Protected (HDCP) sources. These include any Blu-ray disk sources and video on demand (VOD) sources. This is described below.

B. Limits on use of analog output due to requirements for content protection (Analog Sunset)

“Analog Sunset” refers to a portion of the Advance Access Content System (AACS) license agreement adopted by content owners and device manufacturers to insure that copyright protected content is not illegally copied and distributed. Analog sunset applies to AACS licensed players, which are products authorized to play back AACS-encrypted content. Currently, the applicable products are standalone and computer-based Blu-ray disk players. Analog sunset appears and is described in Exhibit E, part 2, section 2.2.2 of the final AACS Adopter Agreement of June 2009 as follows:

- 2.2.2.1 Analog Sunset – 2010. “With the exception of Existing Models, any Licensed Player manufactured after December 31, 2010 shall limit analog video outputs for Decrypted AACS content to standard definition (SD) Interface Modes only (composite video, S-video, 480i component video, and 576i video)
- 2.2.2.2 Analog Sunset – 2013. No licensed Player that passes Decrypted AACS Content to analog video outputs may be manufactured or sold by Adopter after December 31, 2013.

While it is understood that the majority of content generated in the SCVWD Boardroom is not from HDCP encrypted Blu-ray disks, there is no guarantee in the future of DVD disks and players going forward. It is entirely possible that standalone and computer-based Blu-ray players will replace DVD's altogether, and that they will be bound by the Analog Sunset 2013.

From a design standpoint, either now or in the near future, the responsible course of action would be to migrate the video switching and distribution system to be based on the transportation of digital signals natively rather than a conversion of every new digital source to analog.

C. Other potential issues (risks) associated with the retention of an analog system

There are uncertainties that may hinder the retention of legacy analog technology. The following scenarios illustrate these potential risks:

- As display technologies advance, there is no certainty that analog connections will be provided on projectors and flat panel displays. If a legacy analog switching system is used in this scenario, there would be a conversion from digital to analog from source to switcher, and another conversion from analog back to digital at the display device. This would represent a poor design approach since you would be adding additional components to keep the current legacy analog switcher in place while adding additional points of failure, added switching time, potential image resolution changes, distorted images, and added unreliability in the long run.
- By the AACP rules, there is no provision to require computers to be equipped with HDCP content protection. However, this does not mean that the computer manufacturers themselves will not implement these changes on their own. For example, currently it is known that there is some degree of HDCP implementation on Apple products. For content that is not protected, there is no requirement for HDCP and it can be disabled on the laptop for non-encrypted content. However, there is no guarantee that Apple will not change their policy and require that these devices only output to HDCP compatible devices. If this becomes a reality, as a non-HDCP compatible device, an analog switcher would be incapable of passing the signal to an HDCP compatible display. To add to this, there is no way to predict how this may influence the policies of other computer manufacturers such as Dell, Lenovo, Asus, etc.
- DVD disks and players are on the decline and may be completely replaced by Blu-ray disks and players altogether. Since all Blu-ray players are bound by the Analog Sunset 2013, this may have an effect on how DVD sources are displayed, or prevent their output completely to non-HDCP devices.

D. Summary

The following represents a list of reasons why a responsible audiovisual designer would migrate from a legacy analog based switching, distribution, and presentation system to one that natively supports digital video signals:

- With the plethora of digital only sources, a natively analog- based system will require digital to analog conversion of video signals which necessitates the use of a digital to analog convertor. The additional required processing of this device adds another point of failure in the system.
- Depending on the type of digital output of the source device, appropriate connector adaptors /dongles will be needed to allow for conversion from one digital format to another and then to a digital to analog convertor. Each adaptor adds another point of failure before the digital to analog conversion takes place.

- Signals that are generated from a digital source look best on an appropriate display or projector when they are unprocessed and unaltered from their original, native state.
- The use of digital to analog conversion increases the time the system takes to switch and display the selected source (switching time).
- With the use of analog to digital conversion, there is no guarantee that the processor will not change the size of the displayed image.
- Analog-based systems are not able to display 4k sources, which will become a requirement in the future as audiovisual technology advances over time.
- Analog-based systems are unable to display High Bandwidth Digital Content Protected (HDCP) sources such as those from Blu-ray disks per the "Analog Sunset". DVD's may ultimately be replaced by Blu-ray disks and players, which are already bound by Analog Sunset 2013.
- There is no guarantee that in the near future, computer vendors will not manufacture devices that require HDCP compatible display devices. In this scenario, an analog-based system will not pass a source signal to output display device.
- There is no guarantee that in the near future, displays and projectors will include analog inputs at all which would in turn require an initial digital to analog conversion for input into an analog switcher, followed by a subsequent analog to digital conversion to the digital only display.

II. Provisions of proposed system for Americans With Disabilities (ADA)

- The existing SCVWD Boardroom has an ADA compliant Assisted Listening System (ALS) which is used by hearing impaired persons to hear audio content being delivered in the Boardroom. The current ALS system is planned to be retained for use in the design of the new Boardroom AV system upgrade.
- A new ADA compliant lectern is planned to be included to the Boardroom AV system upgrade so that persons in a wheelchair can access all user AV controls in the lectern.

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Sincerely,



Phil Ferlino, CTS
Principal
RGD Acoustics, Inc.