

1.0 GENERAL

1.1 Related UBC Guidelines

- .1 [UBC Learning Space Design Guidelines](#)

2.0 MATERIALS AND DESIGN REQUIREMENTS

2.1 Design Criteria

- .1 All video outputs to display devices shall be digital outputs, with scaling capability provided either by the display device itself or by an external scaler located immediately prior to the display device input. The scalers must be able to maintain the original signal aspect ratio (4:3, 16:10 or 16:9), and should support HDTV and 4K resolutions (720P, 1080i, 1080P, Ultra HD, 4K DCI).
- .2 All digital video sink equipment will be HDCP compliant, communicate EDID status and accept signals with a minimum bit depth of 24bits at a resolution of 1920 x1080 pixels @60Hz or 1080P. Equipment that is not HDCP compliant, such as a video conferencing codec or lecture capture recorder, shall be reviewed with UBC IT Audio Visual for approval.
- .3 Video switching infrastructure will be required to support TMDS digital inputs (DVI-D/HDMI) with minimum resolution of 4K. The digital signal input, switching and distribution system must be HDCP compliant (minimum of HDCP2.2).
- .4 Video projection systems must be designed to deliver a minimum of 60 Lumens/sq.ft in typical learning spaces with multiple zone lighting and typical blind systems. In very large lecture theatres with screens over 14m² image areas, and complete ambient lighting control to a full blackout, special project by project allowances may be considered to reduce that requirement to balance projector cost versus performance.
- .5 The following table provides a guide for selecting a laser projector brightness in lumens by typical screen size. As per ANSI/INFOCOMM 3M-2011, the contrast ratio is minimum 15:1 for classroom content and a constant light output percentage of 80%. The ambient light Lux values are the approximate sunlight and artificial light shining on the projection surface. These brightness values are suggestions for high-level discussions and design – the AV designer shall validate brightness requirements for each application.

Image Size			Projector Lumens by Ambient Light					
			Good 0 – 50 Lux		Better 51 – 65 Lux		Best > 65 Lux	
Height	Width	Diagonal	Lm	Lm/Ft ²	Lm	Lm/Ft ²	Lm	Lm/Ft ²
50"	80"	94"	5,000	144.0	5,000	144.0	5,000	144.0
57.5"	92"	109"	5,000	108.9	5,000	108.9	5,000	108.9
60"	96"	113"	5,000	100.0	5,000	100.0	5,500	110.0
65"	104"	123"	5,000	85.2	5,000	85.2	6,500	110.8
69"	110"	130"	5,000	75.9	5,500	83.5	7,000	106.2
72.5"	116"	137"	5,000	68.5	6,500	89.0	9,000	123.3
87"	139"	164"	7,000	66.7	9,000	85.7	12,000	114.3
100"	160"	189"	9,000	64.8	12,000	86.4	15,000	108.0
110"	176"	208"	10,000	59.5	15,000	89.3	20,000	119.0
117.5"	188"	222"	12,000	62.6	15,000	78.2	20,000	104.3

- .6 All RF CATV equipment is intended to operate at a nominal level of 0 dBmV to +50 dBmV on 50 ohm or 75 ohm lines.
- .7 All composite and component video equipment is nominally intended to operate at 1 V p-p on 75 ohm lines. Provide terminations and interstage and distribution amplifiers as required.
- .8 Video projectors must be mounted to minimize risk of vibration or shake, either initiated by mechanical systems or from wall movement caused by doors closing or people walking on the floors above the projector mounts. Structural rigidity should be raised with project structural engineer, especially where lightweight construction methods are being employed.
- .9 Projectors and displays will be equipped with Sonic Shock alarms or 4-digit combination padlocks (owners choice) and anti-theft fittings and hardware.
- .10 Projection booth glazing and projection ports must have glass with anti-reflective coating on both sides. Use angled glass to prevent a reflected image from being sent back into the projector lens. A seven degree outward tilt from the perpendicular plane of the projector is recommended.

2.2 Video Source Equipment

.1 Robotic Video Camera

- .1 Where robotic PTZ cameras are used in classrooms for lecture capture, overflow connectivity, or remote audiences the cameras will have HD resolution to 1080P, and the output will be available on a suitable TMDS connector (HDMI/DVI-D).
- .2 The units should use a VISCA RS-232/RS-485 or Ethernet control protocol and should feature at least 6 internal presets that include PTZ settings and focus.
- .3 The units should feature an adequately large optical zoom range so that the widest to narrowest shots required can be achieved without using digital zoom.
- .4 The cameras should be usable when mounted upright or inverted.
- .5 Approved manufacturers are:
 - .1 Panasonic
 - .2 Sony
 - .3 Vaddio
 - .4 Clearone
 - .5 AVer

.2 Robotic Tracking Video Camera

- .1 *Where robotic tracking PTZ cameras are used in classrooms for lecture capture, overflow connectivity, or remote audiences the cameras will have HD resolution to 1080P, and the output will be available on a suitable TMDS connector (HDMI/DVI-D/USB/RJ-45).*
- .2 *The units should use a VISCA RS-232/RS-485 or Ethernet control protocol and should feature at least 6 internal presets that include PTZ settings and focus.*

- .3 *The units should feature an adequately large optical zoom range so that the widest to narrowest shots required can be achieved without using digital zoom.*
- .4 *The cameras should be usable when mounted upright or inverted.*
- .5 *The cameras should have multiple tracking modes including People Tracking, Zone Tracking, Voice tracking and Hybrid mode that switches between People & Zone tracking modes.*
- .6 *Approved manufacturer is Aver.*

.3 Document Camera

- .1 Table top mounted document cameras will have a collapsible camera arm and will have integrated top lighting for the object table.
- .2 Document cameras will have a minimum resolution capability of 1280x720 on analog VGA and DVI-D/HDMI outputs. The output signal should not be HDCP protected.
- .3 The document camera must include secure table top mounting brackets to reduce risk of theft.
- .4 Approved manufacturers are:
 - .1 Elmo
 - .2 Epson (additional UBCO option)

.4 Computer Inputs

- .1 Input panels mounted on walls, in racks, in lectern troughs, in meeting room tables and any other location must use industry standard Extron modular input plates, in either MAAP or AAP format.
- .2 Digital inputs will use panel mounted HDMI connectors, mounted face up or at 90 degrees, and in such a fashion as to relieve stress on HDMI connector when the cable is inserted.
- .3 HDMI inputs must include highly flexible connection cables between plates and laptops. Overly rigid, thick, or otherwise difficult to manage cable types will be rejected.
- .4 Laptop cables must include a strain relief and a cable locking system to keep cables attached to AV input plates. When input plates are wall mounted, wall mounted J-hooks will be installed for cable storage. These hooks are to be mounted securely, adjacent the input plate, at a distance of approximately 18" apart. Hooks should be mounted at a comfortable height that is easily accessible, and in such a way that cable loops do not drape over/impede access to either the AV input plate, or nearby power or data outlets.

.5 Wireless Presentation Gateway

- .1 The presentation gateway shall provide Ethernet to HDMI conversion of audio and video signals. Portable devices shall be able to connect to the gateway through the local Wi-Fi network.
- .2 The presentation gateway shall support up to *ten (10)* user connections.

- .3 The presentation gateway shall support the following operating systems:
 - .1 Windows 10
 - .2 Mac OS X (v10.10 or higher)
 - .3 Apple iOS
 - .4 Android
- .4 The presentation gateway shall support Apple AirPlay mirroring.
- .5 *The presentation gateway shall support USB web conferencing peripherals such as soundbars, & cameras. USB connection to be USB2.0 type A or USB3.0 type A. Must be compatible with Microsoft Teams and Zoom software.*
- .6 Video Output Resolution, 1280x720@60Hz (720p60), 1280x800@60Hz, 1280x1024@60Hz, *1366x768@60Hz*, , 1440x900@60Hz, 1600x1200@60Hz, *1600x900@60Hz, 1680x1050@60Hz*, 1920x1080@60Hz (1080p60), *3840x2160@30Hz (2160p30), , 3840x2160@60Hz (2160p60)* .
- .7 Audio Standards:
 - .1 PCM 2-channel
- .8 Audio/Video Connector:
 - .1 One (1) female 19-pin Type A HDMI
 - .2 One (1) HD15 female
 - .3 One (1) 3.5 mm TRS mini phone jack
- .9 Network Interface:
 - .1 One (1) LAN/Ethernet, RJ-45, 10/100/1000 Mbit
- .10 Power supply:
 - .1 Local DC power source.
- .11 Mounting:
 - .1 Freestanding.
 - .2 Surface mount.
 - .3 Built-in to DigitalMedia Presentation System.
- .12 Product shall be the following or Approved Equal:
 - .1 Crestron *AM-3200*
 - .2 Crestron DMPS3-4K-250-C
 - .3 Crestron DMPS3-4K-350-C

2.3 Networked Audio-Video over IP Switching and Distribution Equipment

.1 Basic Function

- .1 The system shall be able to facilitate audio and video distribution over a standard 1 gigabit network. The system components shall include support for real-time signal up to 4K60.
- .2 The system shall be composed of endpoints (hardware encoders and decoders) and network switches.

- .3 The system shall be capable of supporting an unlimited number of endpoints.
- .4 The maximum bandwidth requirement per endpoint stream shall be 1 gigabit.

.2 Transmission

- .1 1 gigabit transmission of video over Ethernet with support for resolutions up to 4K60.
- .2 The endpoints shall support automatic bit rate adjustment set by the resolution of the stream.

.3 Network Requirements

- .1 The system shall operate on Category 5e or better infrastructure.
- .2 The system shall utilize standard 1 gigabit Ethernet.
- .3 The system shall support unicast or multicast traffic to distribute streams across a network.
- .4 The system shall not require proprietary network management software or hardware, Ethernet switches or network protocol.
- .5 *All switches must be non-blocking and configured in such a way to meet all AV-over-IP protocol requirements including but not limited to IGMP, Multicast, PIM-SM and QoS.*
- .6 *Approved Audio-Video over IP switches are Cisco and Netgear.*

.4 System Integration

- .1 The system shall support integration with a single software management platform to provide complete system monitoring, management and control.
- .2 The management platform shall support the following functions:
 - .1 Automatic device configuration including firmware updates, security patches, and device settings
 - .2 Manage feature licences

.5 Audio-Video over IP Endpoints

- .1 Endpoints shall allow encoding or decoding of up to 4K60 video signal and stereo audio signal.
- .2 Endpoints shall require a maximum bandwidth of 1 gigabit.
- .3 Endpoints shall support web-based control and management.
- .4 Endpoints shall have the following video features:
 - .1 One (1) HDMI video connection
- .5 Endpoints shall have the following audio features:

- .1 Two-channel Dante network audio, Two-channel AES67 network audio or two-channel balanced analog audio
- .6 Endpoints shall have the following control features:
 - .1 One (1) 1000-BASE-T Ethernet port for stream connection
 - .2 One (1) 100-BASE-T or faster Ethernet port or one (1) RS-232 port for device control
- .7 Endpoints shall support local or remote DC power source and PoE+ via network switch or power injector.
- .8 Approved manufacturers are:
 - .1 Crestron NVX, *Kramer KDS-7 Series, and Atlona Omnistream*

2.4 Point-to-Point Video Switching and Distribution Equipment

.1 Fiber Optic HDMI Extender Transmitter

- .1 Fiber optic HDMI input extenders will have at least one HDMI input connector, an HDMI loop thru connector for a local display, a stereo audio input, and a set of multi-mode fiber output connectors. Must be at least HDMI 2.0 compatible.
- .2 The unit must be HDCP 2.2 compliant and have the option for EDID management or emulation at the transmitter.
- .3 Crestron fiber optic distribution does not support 4K resolution. Fiber optic video distribution shall only be implemented when transmission distance is more than 100m or integrating with an existing fiber optic system, and 4K resolution is not an essential system requirement.
- .4 Approved manufacturers are:
 - .1 Crestron Digital Media 8G+
 - .2 Extron Fox Series
 - .3 *Kramer Ultra-Reach*

.2 Fiber Optic HDMI Extender Receiver

- .1 Fiber optic HDMI output extenders will have at least one HDMI output connector, a stereo audio output, and a set of multi-mode fiber input connectors. Must be at least HDMI 2.0 compatible.
- .2 The unit must be HDCP 2.2 compliant and have the option for HDCP key management.
- .3 Approved manufacturers are:
 - .1 Crestron Digital Media 8G+
 - .2 Extron Fox Series
 - .3 *Kramer Ultra-Reach*

.3 Fiber Optic HDMI Extender Scaler Receiver

- .1 Fiber optic HDMI output extenders will have at least one HDMI output connector, a stereo audio output, and a set of multi-mode fiber input connectors. Must be at least HDMI 2.0 compatible.
- .2 The unit must be HDCP 2.2 compliant and have the option for HDCP key management.
- .3 The receiver will have a built in scaler to allow resolutions of different display devices to be matched to the system resolution. The scaler must provide an option to maintain the original source aspect ratio.
- .4 Approved manufacturers are:
 - .1 Crestron Digital Media 8G+
 - .2 Extron Fox Series

.4 Fiber Optic Digital Video Matrix Switcher

- .1 Fiber optic digital video switcher will accept multi-mode fiber inputs and provide multi-mode fiber outputs. Matrix sizing will depend on system complexity, and should be sized to allow for future expansion.
- .2 The unit will switch TMDS video signals and be HDCP compliant.
- .3 The switcher frame will include power supplies and necessary fiber input and output cards.
- .4 Approved manufacturers are:
 - .1 Crestron Digital Media 8G+
 - .2 Extron Fox Series

.5 Hybrid Digital Video Matrix Switcher

- .1 Hybrid switchers may combine fiber optic digital video multi-mode fiber inputs and provide multi-mode fiber outputs with copper Shielded Twisted Pair digital video inputs and outputs in the same chassis. Matrix sizing will depend on system complexity, and should be sized to allow for future expansion.
- .2 The unit will switch TDMS video signals and will be HDCP compliant.
- .3 The switcher frame will include power supplies and necessary fiber or copper input and output cards.
- .4 Approved manufacturers are:
 - .1 Crestron Digital Media 8G+
 - .2 Extron Fox Series

.6 Copper Shielded Twisted Pair Digital Video Matrix Switcher

- .1 Switchers using STP copper digital video inputs and outputs. Matrix sizing will depend on system complexity, typically 8x8 to 32x32.
- .2 The unit will switch TDMS video signals and will be HDCP compliant.

- .3 The switcher frame will include power supplies and necessary fiber or copper input and output cards.
- .4 Approved manufacturers are:
 - .1 Crestron Digital Media 8G+
 - .2 Extron Fox Series

.7 UTP HDMI Extender Transmitter

- .1 UTP HDMI input extenders will have at least one HDMI input connector, an HDMI loop thru connector for a local display, a stereo audio input, and UTP output connectors. Must be at least HDMI 2.0 compatible.
- .2 The unit must be HDCP 2.2 compliant and have the option for EDID management or emulation at the transmitter.
- .3 The extender transmitter will require only one UTP cable, and must support signal transmission over distances of up to 100 meters.
- .4 The extender transmitter must support a minimum resolution of 4k at 60hz
- .5 Approved manufacturers are:
 - .1 Crestron Digital Media
 - .2 Extron
 - .3 Kramer

.8 UTP HDMI Extender Receiver

- .1 UTP HDMI output extenders will have at least one HDMI output connector, a stereo audio output, and a UTP input connectors. Must be at least HDMI 2.0 compatible.
- .2 The unit must be HDCP 2.2 compliant and have the option for HDCP key management.
- .3 The extender receiver will require only one UTP cable, and must support signal transmission over distances of up to 100 meters.
- .4 The extender receiver must support a minimum resolution of 4k at 60hz.
- .5 Approved manufacturers are:
 - .1 Crestron Digital Media
 - .2 Extron
 - .3 Kramer

2.5 Laser Projectors

- .1 The projector must have at least one (1) HDCP compliant digital input, preferably HDMI 2.0. Displays should be specified with adequate input counts for the application.
- .2 The projector must have at least one (1) HDMI input, one (1) HDBaseT input, and one (1) RS-232 port.
- .3 The projector must have a minimum of 1920 x 1200 native resolution, and support all HDTV resolutions plus standard computer resolutions.

- .4 DLP based projectors are preferred, but LCD and other technologies will be considered, as long as they are field serviceable by UBC.
- .5 The projectors light source shall be laser diode with an expected half luminance life of 10,000 hours when running in normal mode. The projector shall be minimum 5,000 ANSI lumens.
- .6 The projectors will have the ability to have custom UBC logo start-up/no-signal screens loaded by users in the field.
- .7 The projectors will have interchangeable lens, and be equipped with horizontal and vertical lens shift as required.
- .8 The projectors used in learning spaces must have a noise level of less than 35dBA.
- .9 The projectors must be controllable via 3rd party control systems using RS-232, Ethernet or HDBaseT. Crestron Connected products are preferred.
- .10 The projectors must have a minimum of a 3 year warranty.
- .11 Approved manufacturers:
 - .1 Panasonic
 - .2 Sony

2.6 Flat Panel Displays

- .1 The flat panel displays must have at least the following:
 - .1 One (1) HDCP compliant digital input, preferably HDMI 2.0.
 - .2 One (1) variable audio output.
- .2 Displays should be specified with adequate input counts for the application.
- .3 The digital inputs must be HDCP compliant
- .4 The flat panel displays must have a minimum of 1920 x 1080 native resolution, and support all HDTV resolutions plus standard computer resolutions.
- .5 The display brightness should be a minimum of 400 Nits at full white.
- .6 The displays should be LED array backlit LCD display
- .7 The display must be controllable via 3rd party control systems, such as Crestron. Crestron Connected products are preferred. RS-232 or Ethernet is accepted as a control interface.
- .8 Professional displays must have a minimum of a 3 year warranty, and consumer or prosumer displays must have a minimum of 1 year warranty.
- .9 Typical manufacturers are:
 - .1 Panasonic
 - .2 Sharp
 - .3 *NEC*
 - .4 *LG*
 - .5 *Sony*

2.7 Manual Projection Screens

- .1 Manual projection screens should only be used for screen widths less than 96" or 2450mm wide.
- .2 Manual screens of any size must have a controlled spring return option included.
- .3 Manual screens must have a matte white fibreglass screen with a black backside.
- .4 For screen sizing calculations refer to the UBC Classroom Design Guidelines.
- .5 Typical manufacturers are:
 - .1 Da-Lite

2.8 Motorized Projection Screens

- .1 Motorized projection screens must be used for screen widths over 96" or 2450mm wide.
- .2 Motorized screens that will be integrated into an AV system with a control system must include LV control, integrated with a standard electrical plug. In the case of very large screens that do not allow this option, a power disconnect switch must be installed between the LVC and building power.
- .3 Motorized screens must have a matte white fibreglass screen with a black backside.
- .4 Screens that are recessed within a finished ceiling must include appropriate trim kit or recessed housing, to allow servicing and replacement from below, without a requirement to modify or damage ceiling.
- .5 For screen sizing calculations refer to the UBC Classroom Design Guidelines.
- .6 Typical manufacturers are:
 - .1 Da-Lite

2.9 Conferencing Endpoint

- .1 The conferencing endpoint shall digitally compress audio and video streams in real time for point-to-point video conferencing meetings.
- .2 The conferencing endpoint shall have the following minimum performance:
 - .1 Protocols:
 - .1 H.323
 - .2 SIP
 - .2 Dual Stream:
 - .1 H.239
 - .2 BFCP
 - .3 Support for resolutions up to 1080p30
 - .4 Independent of the main stream resolution
 - .3 Bandwidth:
 - .1 1080p30 from 1472 kbps
 - .2 1080p60 from 2560 kbps
 - .4 Video Standards:
 - .1 H.263

- .2 H.263+
- .3 H.264
- .5 Video Input Resolution: 1920 x 1080@60 and 59.94 Hz (1080p60), 1920 x 1080@50 Hz (1080p50), 1920 x 1080@30 and 29.97 Hz (1080p30), 1920 x 1080@25 Hz (1080p25), 1920 x 1080@24, and 23.97 Hz (1080p24), 1280 x 720@60, and 59.94 Hz (720p60), 1280 x 720@50 Hz (720p50), 1280 x 1024@60, and 75 Hz (SXGA), 1024 x 768@60, 70, 75, and 85 Hz (XGA), 1440 X 900@60 Hz (WXGA+), 1280 x 768@60 Hz (WXGA).
- .6 Video Output Resolution: 1920 x 1080@60 Hz (1080p60), 1920 x 1080@50 Hz (1080p50), 1280 x 720@60 Hz (720p60), 1280 x 720@50 Hz (720p50)
- .7 Audio Standards:
 - .1 G.711
 - .2 G.722
 - .3 G.722.1
 - .4 G.728
 - .5 G.729
 - .6 ACC-LD
 - .7 OPUS
- .8 IP Networking:
 - .1 DNS lookup
 - .2 IP adaptive bandwidth management
 - .3 H.245 DTMF tones in H.323 and RFC 4733 DTMF tones in SIP
 - .4 URI dialing
 - .5 TCP/IP
 - .6 DHCP
 - .7 802.1Q VLAN
 - .8 802.1p QoS
- .9 Network Interface:
 - .1 One (1) LAN/Ethernet, RJ-45, 10/100/1000 Mbit
- .10 Control Interface:
 - .1 Full application programming interface (APIs) via TCP/IP and RS-232C.
- .3 Provide splitter adapter as required to extend camera connection.
- .4 Product shall be Cisco, Polycom or Approved Equal.

2.10 **Soft Codec Endpoints**

- .1 *The Soft Codec Endpoint PC shall be a Windows 11 based PC with minimum two Digital Video (HDMI/DVI-D/USB-C) outputs, two USB-A 2.0, two USB-A 3.0, 3.5mm audio jack and one network port*
- .2 *The Soft Codec Endpoint PC shall have as a minimum spec Intel Core i5-12400T Processor, Windows 11 Pro 64, 8 GB RAM, 256 GB SSD Hard drive, Integrated Graphic Card and Integrated Gigabit Ethernet Port*
- .3 *The Soft Codec Endpoint PC shall be compatible with Microsoft Teams and Zoom conferencing software and capable of either single or dual screen conferencing*
- .4 *Approved product is Lenovo Thinkcentre Tiny (Intel) Desktop*

2.11 Interactive Display System

- .5 The interactive display must have at least one (1) HDCP compliant digital input, preferably HDMI 2.0. Display should be specified with adequate input counts for the application.
- .6 The interactive display must have a minimum of 1920 x 1080 native resolution, and support all HDTV resolutions plus standard computer resolutions.
- .7 The interactive display should have an average brightness of 300 cd/m2.
- .8 The interactive display should be LED array backlit LCD display.
- .9 The interactive display system shall have 10-point capacitive multi-touch.
- .10 The writing surface shall have fingerprint and scratch resistance.
- .11 The interactive display must be controllable via 3rd party control systems using Ethernet or RS-232.
- .12 The interactive display must have a minimum of a 3 year warranty.
- .13 The interactive display size shall be minimum of 65" diagonal.
- .14 The *interactive* display shall be mounted using an appropriate wall mount tilt bracket *or motorized mount if size makes top edge unreachable for user*. The product manufacturer for the mount shall be Chief, *LOFT or Jiro Pro-Lift*.
- .15 Product shall be Sharp PN-L803C, LOFT D3xx or Approved Equal.

3.0 EXECUTION

3.1 Wiring

- .1 Isolate all BNC video connectors from building ground on all panels, plates and bulkheads.
- .2 Install video cable in a manner that will prevent sharp bends or kinks. Use right angle BNC connectors where necessary to prevent cable kinking in shallow electrical boxes.

3.2 Test Equipment

- .1 Provide video test equipment on site during check-out where necessary to measure and document the system performance outlined in section 3.8:
 - .1 800 MHz oscilloscope
 - .2 Video test generator with digital video signal resolutions up to 1920x1200 pixels, as well as 720P and 1080P HDTV signals
- .2 Provide the following fiber optics test equipment on site during check-out where necessary to measure and document the system performance outlined in section 3.8:
 - .1 Optical meter, optical sources, two test jumpers & adapters, for 850nm & 1310nm multimode & single mode fiber optical systems testing
 - .2 Optical Time Domain reflectometer (OTDR) and test fiber box for 850nm & 1310nm multimode & single mode fiber optical systems testing
 - .3 Fiber termination microscope

- .3 Provide test equipment of professional quality and in good working order. Substandard equipment will be cause for rejection. The Owner, or their designated Consultant reserves the right to demand proof of equipment accuracy.

*****END OF SECTION*****