BLUSTREAM

MULTICAST

HDMI Over IP Technical Review

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A New Era
OF VIDEO DISTRIBUTION
4 K   U H D   V I D E O   O V E R   I P

Multicast UHD from Blustream delivers virtually latency free distribution of HDMI video over a 1GB Network switch. Using lossless compression technology, Multicast delivers HDMI, IR and RS-232 up to lengths of 100m over a single CAT cable.

The beauty of Multicast is its flexibility and ease of installation. The industry has been requesting a video over IP solution that can be installed in minutes negating the need for any networking qualifications. Multicast UHD has been developed in line with these objectives and is now ready to deliver a new era in advanced video distribution.

Residential

Utilising existing CAT cable infrastructure throughout a home, our solutions can transmit 4K resolutions to multiple displays with ease. No longer must all sources be located in a central location as per typical rack-based matrix solutions, as the Multicast products allow sources to be installed in any location throughout the home.

All the Multicast products require is a single CAT cable to each Multicast product.

Our Multicast products have been tested and approved for compatibility with all recognised manufacturers of TV displays and AV hardware.

Many commercial installations will far exceed the capabilities of any standard HDMI / HDBaseT distribution system.

The Blustream Multicast hardware is not limited by the standard constraints of other methods of distribution, allowing thousands of Multicast source and display hardware to be installed at any location, across existing network infrastructures that can be extended over many Kilometres.

Commercial

Multicast UHD Has 4 Operational Modes

The Blustream Multicast video distribution platform has 4 operational modes meaning the technology can be used to solve many different AV distribution application requirements.

Matrix distribution with unlimited configuration options (Requires 1GB network switch)

Video wall presentation (Feature possible with or without network switch)

One-to-one HDMI extender (No network switch required)

One-to-many HDMI distribution (No network switch required)

UNDERSTANDING THE
Technology

VIDEO IP OVER
Distribute HDMI video over IP via traditional network infrastructure allowing for virtually limitless source devices and display devices to be connected.

ZERO LATENCY
Virtually latency free (1 frame) distribution delivers flawless image quality regardless of how many display devices are in the system.

HDCP 2.2
HDCP2.2 is the next generation of copy protection required to allow the playback of the latest 4K source media.

4K
A 4K screen has four times the number of pixels than a Full HD 1080p display so the clarity of the image is far superior and more detailed.

PoE
Power over Ethernet allows you to power the Transmitter and Receivers via the LAN switch, removing the need for a local power supply at each location.

HDR
HDR (or High Dynamic Range) expands the ability of a display to show a wider and richer range of colours, much brighter whites, and much darker blacks (10 bit).

AUDIO BREAKOUT
HDMI carries both HD video and audio. Extract the audio element of the HDMI signal to feed into your home stereo / audio system for a better quality sound experience.

HD AUDIO
Compatible with the latest high definition audio resolutions. HD audio featured on many sources is supported in formats such as Dolby Digital and DTS.

BI-DIRECTIONAL CONTROL
Bi-directional RS-232 and IR pass through allows seamless control of AV devices anywhere in the system.

VIDEO SCALING
Built in high quality video scaling ensures your display devices receive a video signal in their native resolution, ensuring the best picture quality available to all dsiplays.

+1
With the ability to add a transmitter or receiver at any location or at any time, the system is both flexible and scalable to meet any demanding requirement.

VIDEO WALL
Multiple display devices can be made into a single video wall array to allow for the viewing of one large media image across multiple screens.

COMPRESSION
Utilising advanced visually lossless compression algorithms, no picture or audio quality is sacrificed, allowing the viewing experience to remain true to the source.

EDID
Extended Display Identification Data. When a source is connected to a screen a digital 'handshake' occurs. This handshake ensures that your screen displays your media with the best possible video and audio quality available.

Why Do We Need HDMI Over IP?

Increase In Video Bandwidth

With the demands of some 4K UHD content, HDR enabled display devices and higher resolution audio formats, the bandwidth requirements of HDMI are ever increasing. Current HDMI cable technologies struggle to transmit this high bandwidth over even modest distances without large signal losses. Technology is therefore required to distribute HDMI signals up to 100 meters. Utilising robust network infrastructure, CAT cabling and traditional IP and Multicast protocols allows convenient and cost effective distribution of HDMI signals.

FORMAT	RESOLUTION	FRAMES/SEC	CLOCK	VBLANK	HBLANK	COLOUR	DATA RATE
720p	1280x720	60	74.25 MHz	30	370	8-bit 4:2:0	2.22 Gbps
1080i	1920x1080	60i	74.25 MHz	45	280	8-bit 4:2:0	2.22 Gbps
1080p/24	1920x1080	24	74.25 MHz	45	830	8-bit 4:2:0	2.22 Gbps
1080p/60	1920x1080	60	148.5 MHz	45	280	8-bit 4:2:0	4.45 Gbps
1080p/24 3D	1920x1080	24 (x2)	148.5 MHz	45	830	8-bit 4:2:0	4.45 Gbps
2160p/24	3840x2160	24	297 MHz	90	1660	8-bit 4:2:0	8.91 Gbps
2160p/30	3840x2160	30	297 MHz	90	560	8-bit 4:4:4	8.91 Gbps
2160p/60	3840x2160	60	297 MHz	90	560	8-bit 4:2:0	8.91 Gbps
2160p/60	3840x2160	60	148.5MHz	90	560	10-bit 4:2:0	11.14 Gbps
2160p/60	3840x2160	60	148.5MHz	90	560	12-bit 4:2:0	13.37 Gbps
2160p/60	3840x2160	60	148.5 MHz	90	1120	8-bit 4:4:4	17.82 Gbps
2160p/60	3840x2160	60	148.5MHz	90	1120	10-bit 4:4:4	22.28 Gbps

The above chart shows the bandwidth requirements for sending HDMI signals without any compression. The bandwidth requirements are the same whether using HDMI or CAT cables for signal distribution.
High-speed HDMI cables will support full 4K 8-bit 4:4:4 (18 Gbps) up to distances of approx 7m. Longer cables are not capable of transmitting higher bandwidths without electronic components present inside the cable.
HDBaseT can support up to 4K 60Hz 8-bit 4:2:0 and 4K 30Hz 8-bit 4:4:4. HDBaseT will not support 4K 60Hz 10-bit 4:4:4 (18 Gbps). HDBaseT signal is only point-to-point.
Blustream Multicast distribution supports 4K 60Hz 10-bit 4:2:0 and 4K 30Hz 8-bit 4:4:4 but the video uses advanced compression technology meaning that cable bandwidth requirements are less than 1Gbps!

System Size

Utilising network hardware removes many limitations of traditional matrix configurations. No longer are you limited in system size due to the number of inputs/outputs imposed by traditional matrices, rather the network infrastructure dictates the maximum number of inputs/outputs, with an imposed limit of 64,516 devices (IP address limitations).

Cabling Distance Limitations

Alternate methods of HDMI distribution using CAT cables are limited to 100m, but a network infrastructure allows multiple network switches to be joined using fibre cable links. With fibre cable distribution it is now possible to distribute 4K HDMI over kilometers.

Hardware Cost

Previous methods of HDMI distribution become expensive when system sizes grow larger than 8x sources and 8x displays. The Blustream Multicast solution is a cost effective solution, especially when quoting large commercial applications.

Network Infrastructure

The heart of the system revolves around network infrastructure. Nearly any Layer 3 (L3) Managed Gigabit network switch can be used but most support the following features:

- **Layer 3 Switching** – Layer 3 switches inspect incoming packets and make dynamic routing decisions based on the source and destination addresses inside. Utilising hardware to carry out switching improves switching throughput and performance (as opposed to slow software based switching), they can also reduce the amount of broadcast traffic, improving network speed and efficiency.

- **Multicast** - Multicast (one-to-many, or many-to-many distribution) is a group communication where information is addressed to a group of network devices simultaneously. This allows for only one data stream to be broadcast for each transmitter, regardless of how many receivers are directed at the stream, greatly reducing bandwidth requirements.

- **Instant Leave/Fast leave** – Instant Leave is associated with Multicast and means that as soon as an active connection is no longer required (the link between Transmitter and Receiver), the Multicast group and flow of track is stopped instantly. This prevents the unnecessary flow of network traffic through the network switch, further reducing bandwidth overheads required.

- **IGMP Snooping** - IGMP Snooping is the process of listening to Internet Group Management Protocol (IGMP) network traffic. The feature allows a network switch to listen in on the IGMP conversation between hosts and routers (Transmitters and Receivers). By listening to this flow of traffic the switch maintains a map of which links need which IP Multicast streams. Multicasts may be filtered from the links which do not need them and thus controls which ports receive specific multicast traffic.

- **Jumbo Frames/Packets/MTU (Maximum Transmission Unit)** - Jumbo Frames are Ethernet frames with more than 1500 bytes of payload. Conventionally, jumbo frames can carry up to 9000 bytes of payload. Raising the maximum transmission units increases the amount of data sent in relation to protocol overhead, making for a more efficient network.

- **Fibre Uplink** - In larger systems where more network ports are required and multiple switches need to be linked together, those equipped with fibre uplink sockets can provide much greater bandwidth (between 10-40Gbs) between switches, to more easily carry the increased demand of multiple IP transmissions.

Each source device is connected via HDMI to a Multicast Transmitter unit which is connected via CAT cable to the network infrastructure. Each display device is connected via HDMI to a Multicast Receiver unit which is also connected via CAT cable to the network infrastructure. The resulting network allows any Transmitter to be displayed on any Receiver.

Why Use Blustream Multicast Over Other Methods Of HDMI Distribution?

Distributing HDMI over IP has many advantages over other methods of video distribution. The most common form of HDMI signal distribution over CAT cable is HDBaseT. The below summarises the advantages of each technology in comparison to the other:

Advantages of using Blustream Multicast

- Under 1Gbps bandwidth for 4K video distribution, meaning less demand on cabling
- Virtually unlimited system size
- Can use any Layer 3, 1GB network switch
- Cable distance - Using multiple network switches and Fibre links a system can extend to Km's
- Direct HDMI connection for local HDCP/EDID handshake to source and display hardware,
- HDR (10-bit colour)
- Source devices can be located anywhere there is a CAT cable (no longer limited to central distribution associated with matrix installations)
- Cost effective for larger installations

Advantages of using HDBaseT

- No video compression
- Cost effective for smaller installations
- Technology has been adopted by 170+ companies, with technology being compatible between brands
- Backwards compatible between HDBaseT chipset specifications
- Supports ARC
- Supports 10/100 Ethernet distribution within the HDBaseT signal

Features both Multicast and HDBaseT support

- Distribution of 4K 60Hz 4:2:0 & 4K 30Hz 4:4:4 sources
- Virtually latency free (1 frame)
- Supports all HDMI audio formats
- EDID Management
- HDCP 2.2 compliant
- Bi-directional IR, RS-232 and USB support

There are several forms of HDMI Over IP signal distribution currently on the market. Below is a comparison chart between the various technologies used, and why we believe the Blustream Multicast method of HDMI distribution is superior:
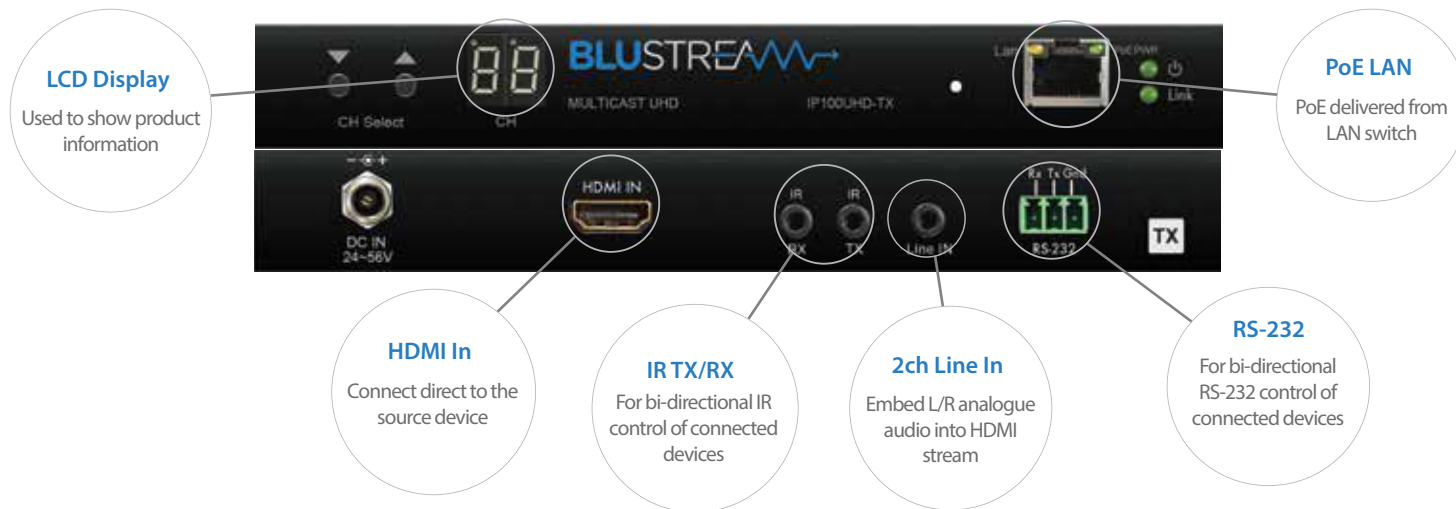
FORMAT	LATENCY	SOURCE FORMAT SUPPORTED	AUDIO FORMAT SUPPORTED	MATRIX/SWITCH REQUIREMENTS	ADVANTAGES	DISADVANTAGES
Blustream Multicast	1 frame (less than 32ms)	4K 60Hz 4:2:0 4K 30Hz 4:4:4	All HDMI formats	1Gb Network	Best Video Quality possible over 1Gb network, lowest end-to-end latency	High 1Gb network bandwidth requirement (<850Mbs), Can-not be decoded by software
H.264 (ASIC)	up to 1 sec	1080p 60Hz 4:2:0	2ch PCM only	1Gb Network	Minimum bandwidth required (<16Mbps), can be decoded by software	Lowest video quality, does not support multi-CH audio, highest latency
H.264 (FPGA)	120ms	1080p 60Hz 4:2:2	2ch PCM only	1Gb Network	Low bandwidth required (<25Mbps), can be decoded by software	Low video quality, does not support bitstream audio, high latency
MJPEG	up to 0.5 sec	1080p 60Hz 4:2:0	All HDMI formats	1Gb Network	Low bandwidth required (<21Mbps), can be decoded by software	Low video quality, high latency, not suitable for high motion such as sports
JPEG2000 (FPGA)	1 frame (less than 32ms)	4K 30Hz 4:2:0	All HDMI formats	1Gb Network	Low bandwidth required (<32Mbps), can be decoded by software	Lower video quality
H.265 (FPGA) Also known as HVEC	Low latency not feasable due to costs	4K 120Hz 8K 60Hz	All HDMI formats	1Gb Network	Low bandwidth requirement	High licensing costs pre-venting use in disitrbution products
SMPT VC-2 (Dirac Pro)	1 frame (less than 32ms)	4K 60Hz 4:2:0 4K 30Hz 4:4:4	All HDMI formats	1Gb Network	Best Video Quality possible over 1Gb network, lowest end-to-end latency	High 1Gb network bandwidth requirement, Cannot be decoded by software
Aptovision	1 frame (less than 32ms)	4K 60Hz 4:4:4	All HDMI formats	10Gb Network	Best video quality possible, supports 4K 60Hz 4:4:4	Expensive, requires 10GB network hardware

Multicast Hardware
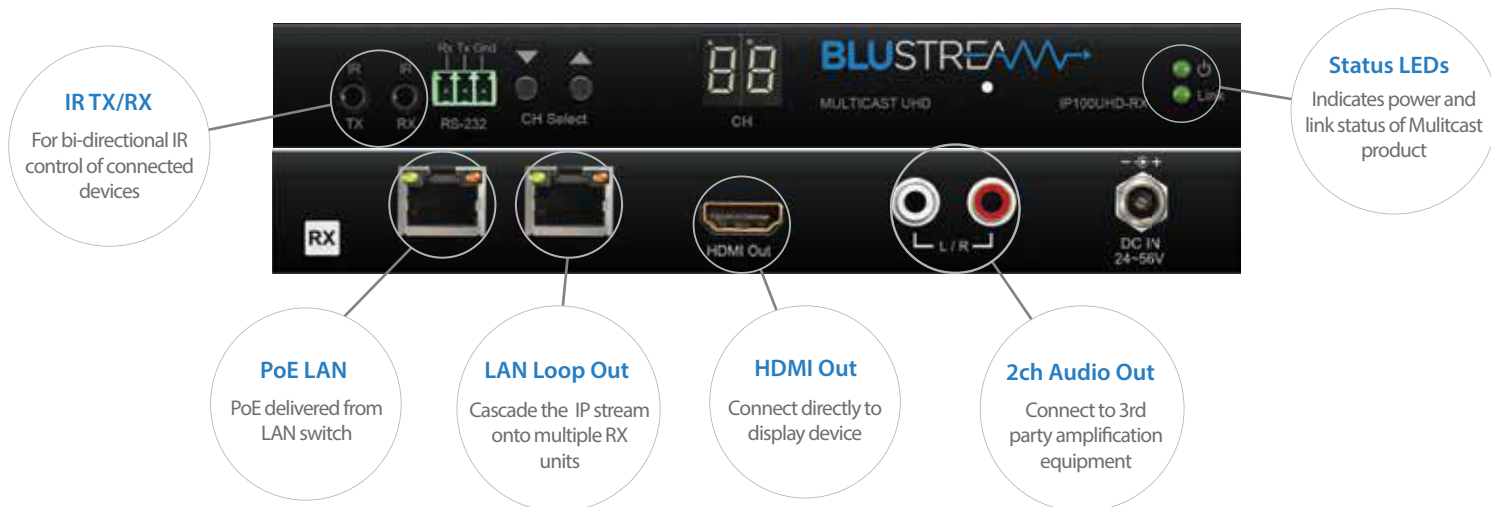
IP100UHD-TX Transmitter

The Blustream IP100UHD-TX is connected to a HDMI source device and transmits the video signal to the network switch.
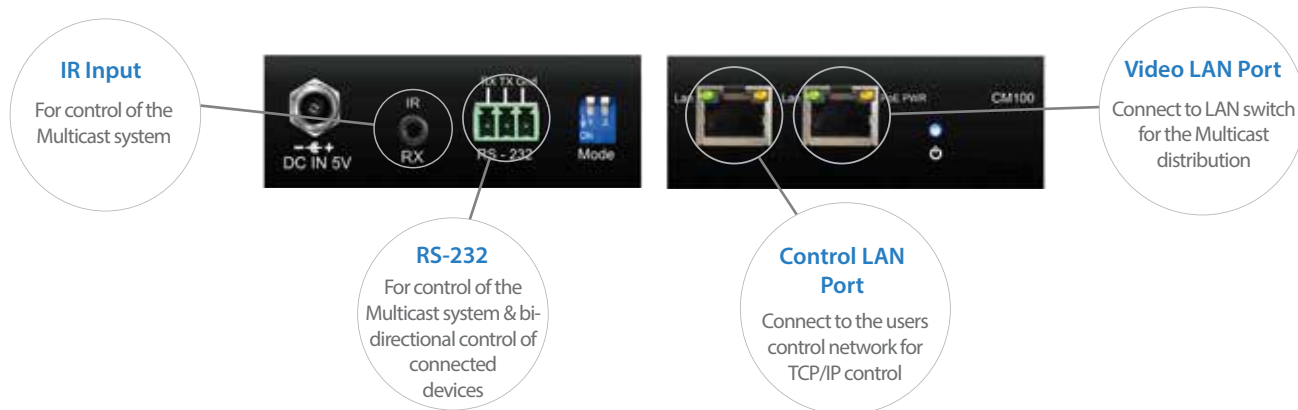

LCD Display

Used to show product information

PoE LAN

PoE delivered from LAN switch

HDMI In

Connect direct to the source device

IR TX/RX

For bi-directional IR control of connected devices

2ch Line In

Embed L/R analogue audio into HDMI stream

RS-232

For bi-directional RS-232 control of connected devices

IP100UHD-RX Receiver

The Blustream IP100UHD-RX is connected to a HDMI display device and receives the video signal from the network switch.

IR TX/RX

For bi-directional IR control of connected devices

Status LEDs

Indicates power and link status of Mulitcast product

PoE LAN

PoE delivered from LAN switch

LAN Loop Out

Cascade the IP stream onto multiple RX units

HDMI Out

Connect directly to display device

2ch Audio Out

Connect to 3rd party amplification equipment

CM100 Control Module

The Blustream CM100 allows simple third party control of the Multicast system using TCP/IP, RS232 and IR.

IR Input

For control of the Multicast system

Video LAN Port

Connect to LAN switch for the Multicast distribution

RS-232

For control of the Multicast system & bi-directional control of connected devices

Control LAN Port

Connect to the users control network for TCP/IP control
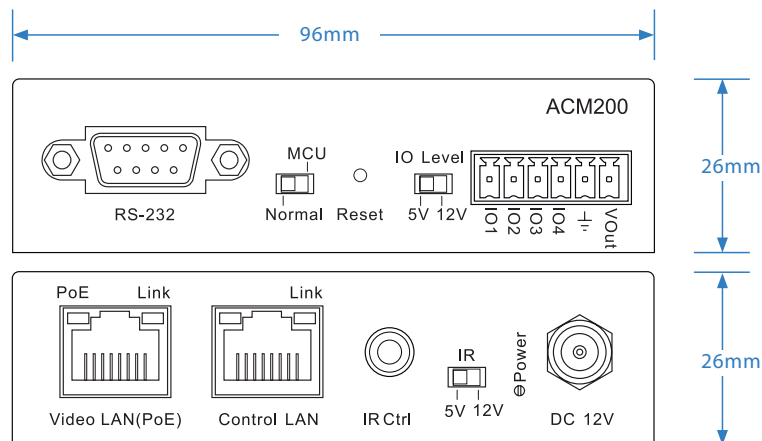
ACM200

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Multicast Advanced Control Module

Description

Our Multicast distribution platform allows distribution of HDMI video over a 1Gb Network switch. The ACM200 Advanced Control Module allows for third party control of the Multicast system using TCP/IP, RS-232 and IR.

The ACM200 includes a web interface module for control and configuration of the Multicast system and features 'drag and drop' source selection with video preview and independent routing of video, audio, IR, RS-232, USB / KVM and CEC. Major third party drivers simplify Multicast product installation and negate the need for an understanding of complex network infrastructures.

PoE	VIDEO **IP** OVER	SSH ENCRYPTION	VIDEO WALL
AUDIO ROUTING	KVM	draganddroptv	WEB GUI GRAPHICAL USER INTERFACE
RS-232 ROUTING	RS-232 CONTROL	CEC CONTROL	IR ROUTING

Key Features

- Web interface module for configuration and control of the Blustream Multicast system
- Intuitive 'drag & drop' source selection with video preview feature for active monitoring of system status
- Advanced signal management for independent fixed routing of IR, RS-232, USB / KVM, audio and video
- Auto system configuration
- 2 x RJ45 LAN connections to bridge existing network to Multicast video distribution network, resulting in:
  - Better system performance as network traffic is separated
  - No advanced network setup required
  - Independent IP address per LAN connection
  - Allows simplified TCP / IP control of Multicast system

- RS-232 integration for control of Multicast system
- IR integration for control of Multicast system
- PoE (Power over Ethernet) to power Blustream product from a PoE switch
- Local 12V power supply (optional) should Ethernet switch not support PoE (PSU not supplied)
- iOS and Android App available - search "Drag and Drop TV"
- 3rd Party drivers available for major control brands

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www.blustream.com.au

HDMI ® HDB.T DOLBY.

Connectivity

- **Ethernet port:** 2 x LAN RJ45 connector (1x PoE support)
- **RS-232 serial port:** 1 x DB-9 female
- **GPIO port:** 1 x 6-Pin Phoenix connector
- **IR Input ports:** 1 x 3.5mm stereo jack

Specifications

- **Dimensions (W x D x H):** 96mm x 110mm x 26mm
- **Shipping Weight:** 0.6kg
- **Operating Temperature:** 32°F to 104°F (0°C to 40°C)
- **Storage Temperature :** -4°F to 140°F (-20°C to 60°C)

Included Accessories

IR Cable	3.5mm to 3.5mm cable
GPIO Connector	6-pin phoenix connector

Control

TCP/IP
Web GUI
iOS / Android App
RS-232
IR

RS-232 Connectivity

Baud Rate:	57600 bps
Data Bit:	8-Bit
Parity:	None
Stop Bit:	1
Flow Control:	None

Regulatory Compliance

FC CE RoHS Compliant CAN ICES-3 (B)/NMB-3(B)

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HDMI HDBT DOLBY
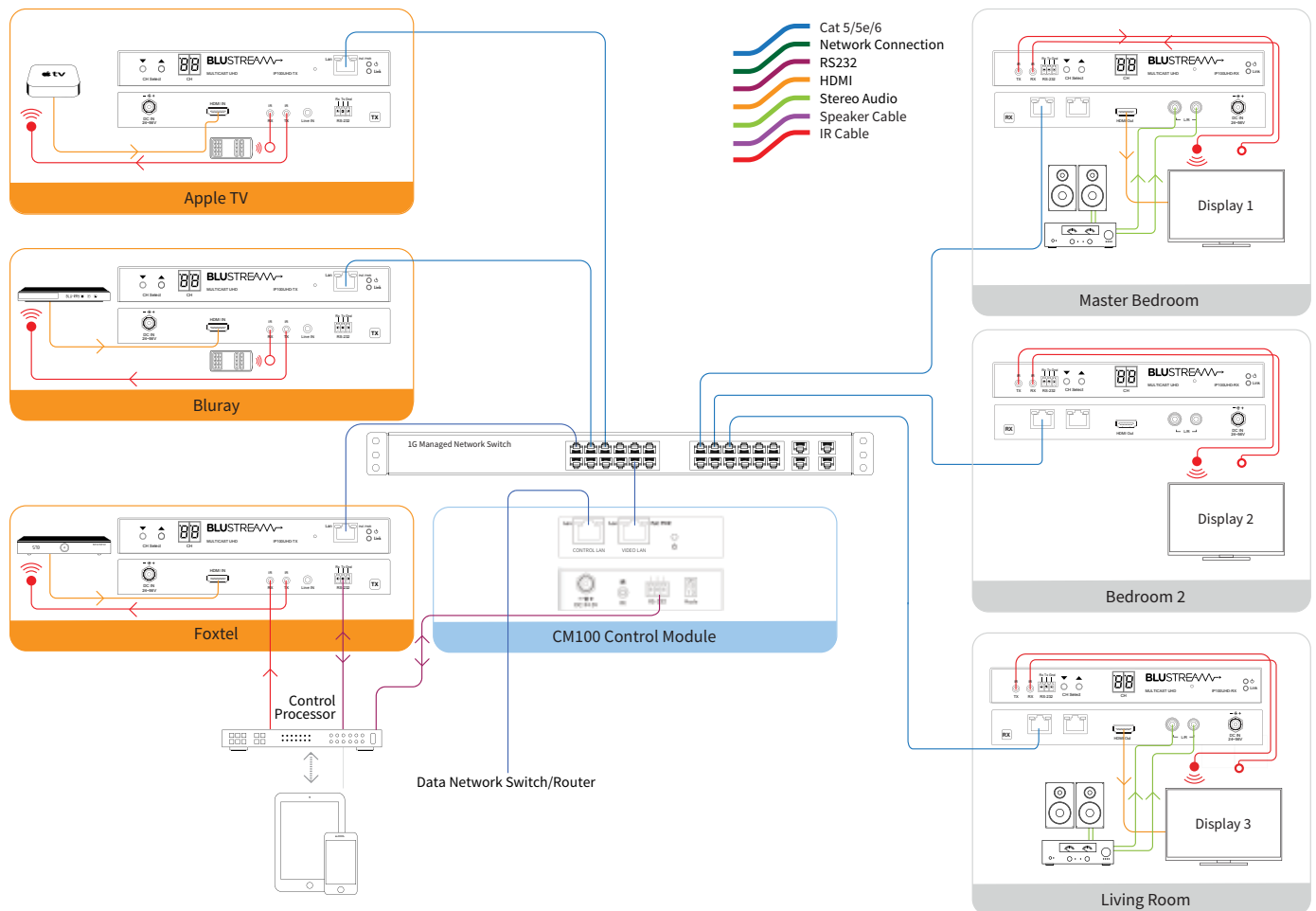
Multicast Installation Case Studies

Residential Application

This typical 3 bedroom apartment in inner city suburbia has been renovated in a contemporary style, incorporating many advancements in audio visual technology and home automation. The AV solution seamlessly integrates with the interior design, combining sophistication and flair with an advanced entertainment system.

An extensive range of audio visual technology was incorporated into this solution, including a 4k UHD video distribution system with the capability to distribute unique content to each room over the IP network. Video sources were located throughout the home while large OLED displays were installed in the master bedroom, second bedroom and living room entertainment area. Each TV has access to any source device throughout the entire house.

Zones/Areas: Master Bedroom, Bedroom 2, Living Room
Sources: Foxtel STB, Bluray Player, Apple TV Media Player

Example Schematic

Cat 5/5e/6
Network Connection
RS232
HDMI
Stereo Audio
Speaker Cable
IR Cable

Apple TV

Bluray

Foxtel

1G Managed Network Switch

CM100 Control Module

Control Processor

Data Network Switch/Router

Display 1
Master Bedroom

Display 2
Bedroom 2

Display 3
Living Room

Multicast Installation Case Studies

Commercial Application

This airport complex brief included the requirements for future expandability and distribution of any video signal in to any of the hundreds of new and pre-existing displays throughout the complex. Information had to be timely with no latency or delay in broadcasts. Distribution of video signals would require displays to be placed over 100 meters away from source devices.

Featuring several hundred Blustream Multicast UHD transmitters and receivers, video distribution over these long distances is handled by a backbone of layer 3 managed network switches all connected by fibre optic uplinks. Onboard video scaling handles the mismatch of resolutions for some pre-existing legacy displays.

Example Schematic

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Example Schematic
IP50HD-TX/RX
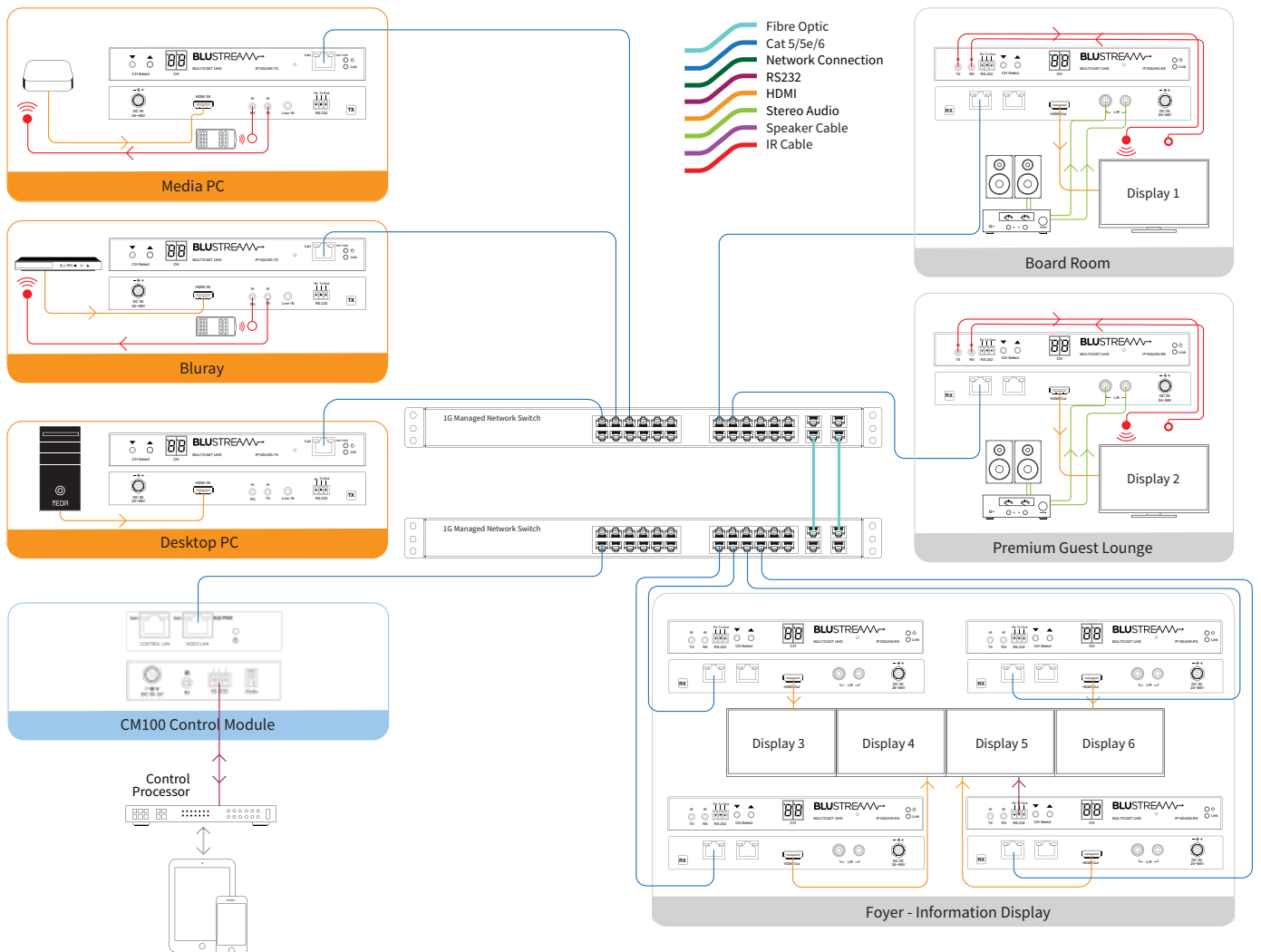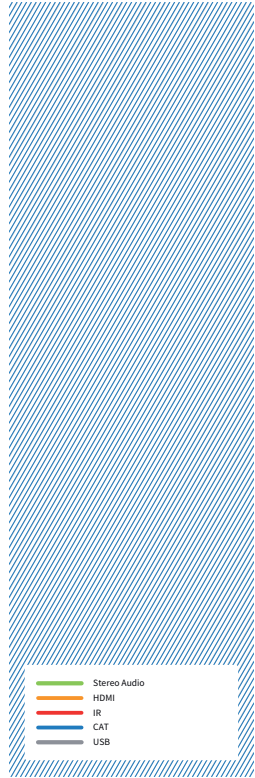
HDMI Over IP System Design – 3x3 Matrix Configuration
(Unlimited Amount of Configurations Available)

SOURCE 01

SOURCE 02

SOURCE 03

IP50HD-TX

IP50HD-RX

ACM200 bridges existing network
to Blustream video network.

Existing Network

ZONE 01

Display 1

ZONE 02

Display 2

ZONE 03

Display 3

Legend:
— Stereo Audio
— HDMI
— IR
— CAT
— USB

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