



Service Description

LiveArena Broadcast Room

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1 Introduction

LiveArena Broadcast Room automates the production of live video hence mitigating the need of production staff. Based on advanced pattern recognition and AI it enables fully automated production of live TV.

We've taken broadcast AI to the next level, embedding never-before-seen artificial intelligence into the LiveArena Broadcast Room. The fully automated suite provides integrated content formats for news, presentations, and talk shows.

Simply select your format, turn on your camera, and watch as the Broadcast Room technology intelligently follows the action. The Broadcast Room evaluates your live stream pixel-by-pixel, analyzing the video input to detect who is speaking and how they are moving, seamlessly tracking the presenter's motion as he moves and speaks.

2 System Overview

The LiveArena Broadcast Room main system components are:

- Camera
- Management Console
- Data Input
- Audio System
- Broadcast Room Computer
- Network Equipment



Systems Overview, a detailed descriptions of the required hardware can be found in the section 3.1.

2.1 Camera

The Broadcast Room camera should be a 4K enabled camera. For best performance and maintenance the camera should be permanently mounted in the room at a distance of between 4-12 meters from the center of attention.

2.2 Management Console

The Management Console should also be permanently mounted. Recommended placement is close to the center of attention since it is used to start and stop the broadcast as well as other management tasks performed by the host of the broadcast.

2.3 Data Input

The Data Input or secondary source connector can be used to connect the host (Presenters) computer via HDMI to NDI over ethernet to the Broadcast Room Computer. It is also possible to connect an external device (e.g. projector or TV) to the source connector via HDMI in order to show the presenters computer to an audience.

2.4 Audio System

The Audio System consists of two wireless microphones with rechargeable batteries and a charging station. The Audio System is self-configuring and communicates with the Broadcast Room Computer over ethernet. The microphones will automatically be switched on when removed from the charging station. The charging station can be mounted.

2.5 Broadcast Room Computer

The heart of the Broadcast Room is the computer that receives the feeds from the Camera and Data Input sources. Both inputs are analyzed and encoded into a single broadcasted stream to the supported streaming platforms (Microsoft Stream and LiveArena Broadcast). The produced and encoded stream is also recorded and stored on a local drive for backup purposes in case of connectivity issues.

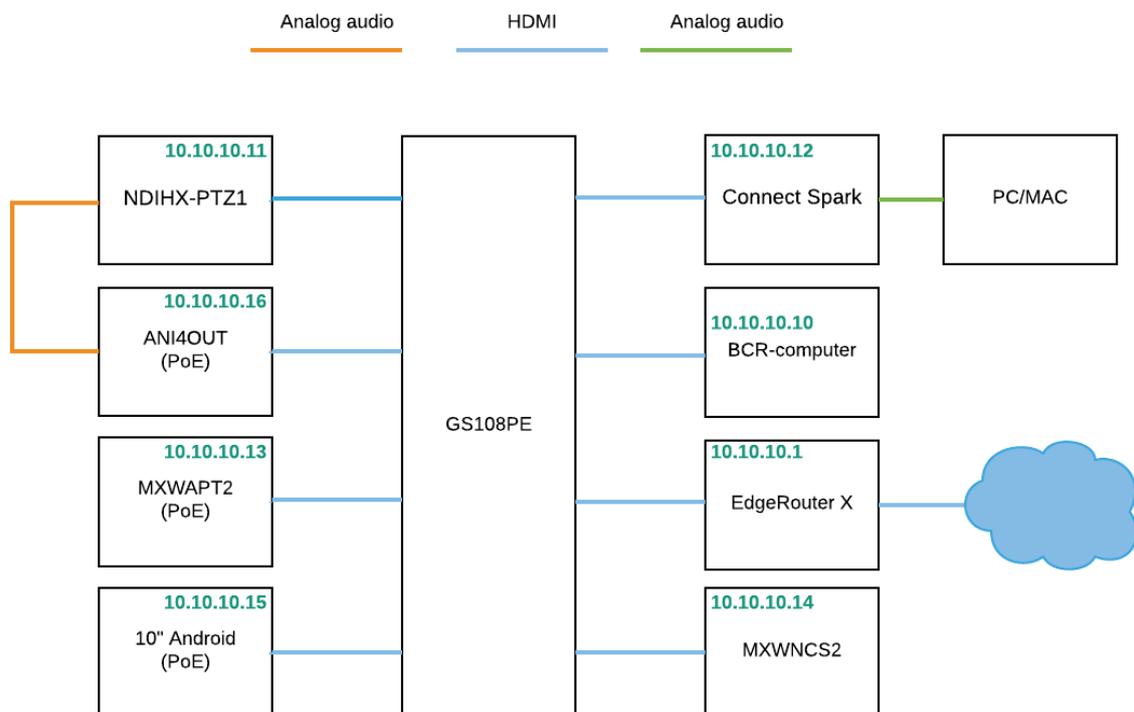
3 Installation

3.1 Required Hardware

Type	Manufacturer	Description/Components	No.	Part No. /Product ID
Computer	N/A	Intel core i7 7820x (8 core),	1	N/A
		GeForce GTX 1050 Ti (4 GB on GPU),	1	
		RAM, Quad channel: 4 * 8 GB (32 GB)	4	
		512 GB SSD M2 (system drive)	1	
		2 TB hard disk (video storage)	1	
		750W power supply	1	
		Debian 9 Linux	1	
Control Panel	Elo	10" Control Panel/Display with onboard Android	1	E021014
	Elo	Control Panel/Display PoE Module Kit	1	E615169

	N/A	Control Panel/Display Wall Mount	1	VESA 75mm
Video/Data Input	NewTek	HDMI to NDI Converter	1	Connect Spark™ Pro
	N/A	Utility Shelf/Connect Spark Mount	1	
	NewTek	NDI PTZ Camera	1	NDIHX-PTZ1
	N/A	Camera Mount (roof or wall)	1	
Audio	Shure	Access Point Transceiver	1	MXWAPT2
	Shure	Networked Charging Station	1	MXWNCS2
	Shure	Hybrid Bodypack Transmitter	2	MXW1
	Shure	Audio Network Interface	1	ANI4OUT
	Shure	Lavalier Microphone	2	MX150B/O-TQG
Network	Ubiquiti	Gateway (Firewall)	1	EdgeRouter ER-X
	Netgear	PoE Switch	1	GS108PE

3.2 Network Diagram

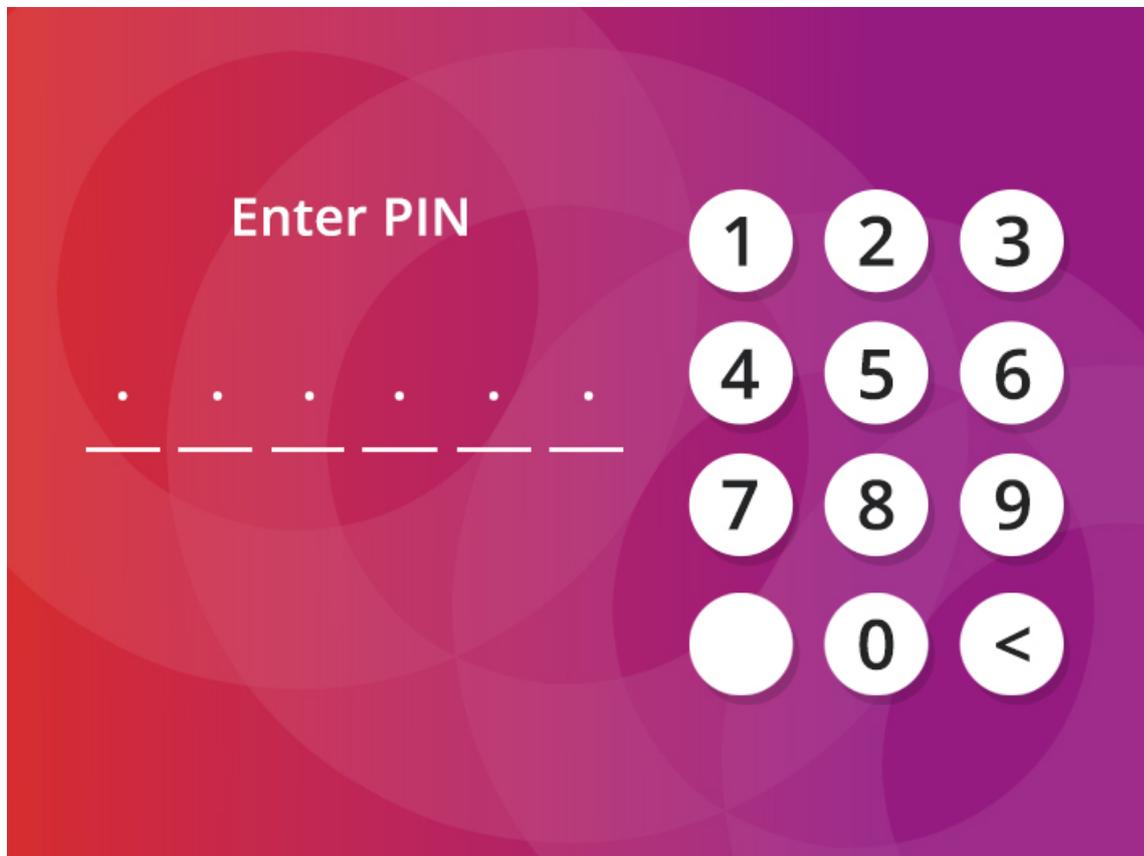


4 Management

The Management Console is used to control the the LiveArena Broadcast Room. This is where the host inputs the globally unique, 6 digit, PIN-code that authenticates and configures the Broadcast Room. It is also used to choose the production format, Presentation or TalkShow, and to decide the destination of the live stream, Microsoft Stream or LiveArena Broadcast.

During a live broadcast the Management Console displays a low-res preview of the outgoing broadcast.

The Management Console also performs continuous self tests of the Broadcast Room equipment to make sure that the system is fully operational. If errors occur they are presented on the Management Console as well as logged to the LiveArena Broadcast administration service.



The Management Console start screen where the PIN-code is entered to initiate the Broadcast.

5 Production Formats

LiveArena Broadcast Room features two production formats, Presentation and TalkShow. Presentation is based on the concept of one host with additional data source consisting of PowerPoint slides, still images or pre-recorded video material. TalkShow is a dialog format with two persons in front of the camera.

5.1 Presentation

The Broadcast Room computer will, during a Presentation run advanced pattern recognition to track the host (Presenter) as the person moves in front of the Camera. As the presenter switches slides the AI of the Broadcast Room will kick in and start to automatically mix between the Camera source and the Data Source. The person tracking feature mitigates the need of a camera man and makes sure to keep the presenter in center frame of the Camera source. Slide switch detection analyzes the image from the Data Source and intelligently decides which scene to present to the viewers. If there are a lot of details in the image the output will be either a side-by-side (butterfly) with the

Presenter and Data Source next to each other or the Data Source in fullscreen. If on the other hand there is less details the Data Source (presentation slides etc.) that source is shown for a brief period of time and primarily cut to full screen shots of the Presenter.

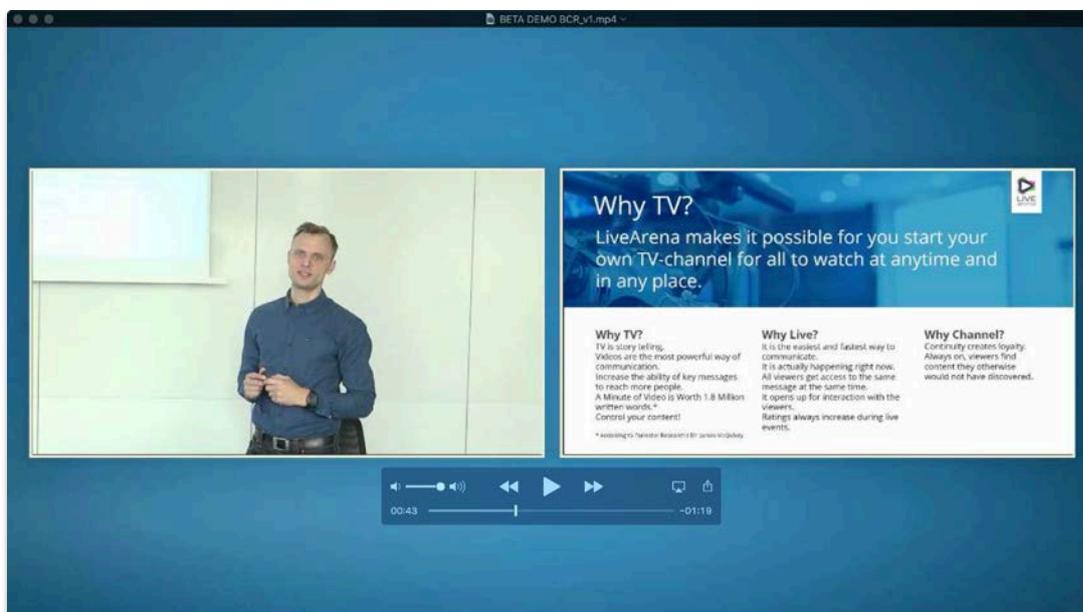
5.1.1 Person tracking

The advanced pattern recognition of the Broadcast Room will evaluate the Camera image pixel-by-pixel to detect the Presenter and how the Presenter is moving. The tracking motion will seamlessly follow the Presenter as he moves in front of the Camera.



5.1.2 Slide switching

Broadcast Room uses advanced algorithms and text analytics to determine when slides or graphics should be shown full-screen, and automatically navigates between the Presenters, full-screen slide view, and side-by-side shots of both the Presenter and the Data Source – always selecting the best and most relevant sources to create a polished and professional production.



5.2 TalkShow

The Broadcast Room computer will, during a Talkshow run advanced pattern recognition to track a host and a guest.

If the host is talking the output will be a close up of the host and vice versa as the guest starts talking. During transitions in the conversation or if both persons are talking at the same time the system will switch to a wide shot featuring both.

5.2.1 Person tracking

The advanced pattern recognition of the Broadcast Room will evaluate the Camera image pixel-by-pixel to detect where the host and guest are located and, if applicable, track them as they move. The person tracking feature mitigates the need of a camera man and makes sure to keep the host and guest in center frame of the different scenes

5.2.2 Speech detection

The AI of the Broadcast Room also uses speech detection analyzes on the audio input to intelligently decides which scene to present to the viewers, always selecting the best and most relevant output to create a polished and professional production.

