

MEDIALON

IMAX Theater Control in a Science Museum

FUNCTIONAL SPECIFICATION

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Functional Analysis

1 Introduction

1.1 Purpose

The purpose of this document is to guarantee that all parties involved are agreed on the answers to the following questions regarding the Science Museum:

- What is the system described actually intended for?
- What are the different components of the system?
- What functionalities will be implemented?

1.2 Terminology

MxM:

- Medialon XObject Module: Medialon Software module allowing Medialon Manager V5 to control Hardware or Software devices.

SCS

- Show Control System.

Show

- A sequence of cues sent to devices to control them in sync to create a specific show.

1.3 Application description

The Dome Theater project is for the Science Museum. The theater is an IMAX film theater that shows two films. The audience sees a short, pre-canned demonstration of the technical elements of the theater (narration, synchronized with lighting and sound effects) that ends with the house lights fading out and the film starting. At the end of the film, the house lights and background music fade up.

There are televisions outside of the theater that display content about other attractions in the museum, previews of the IMAX shows, as well as general information for the gift shop, etc. The video feeds to these televisions are controlled from the main projection room by the projectionists.

Because new IMAX films can be brought in to be presented, it should be possible to easily re-program the show control system without calling for experienced programmers.

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2 System components and overview

The equipment controlling and to be controlled which are parts of the system include:

- Master Show Controller

The control software is an off-the-shelf solution that operates on a PC computer, with a network card, a video capture card, a Timecode card and DMX card installed, running Windows XP Pro or higher. Specific programming of the software is restricted to interfacing with drivers. The software includes a built-in editing tool. It must be capable of synchronizing devices at an accuracy of a 100th of a second and be synchronized on external SMPTE Timecode.

The software allows control of an unlimited number of external devices over TCP/IP, or TCP to other protocol interfaces (DMX, MIDI, Serial, Digital / Analog IOs, Infrared). It provides existing drivers to control common AV equipment, plus a built-in editing graphical tool to write/edit drivers for TCP/IP Servers & Clients, UDP, MIDI and Serial.

The software provides drivers to third party software in PC and Mac, ODBC drivers to most common databases (SQL, Excel...), FTP and Windows OS file management. It shall also provide ability to send and receive email and analyze the content of text.

The software offers programming of an unlimited number of tasks to send commands to connected devices, in a synchronized or logical manner, and permanently monitor and record the main parameters of all connected devices. Tasks in the software can be scheduled and triggered by external scheduling software.

The software shall provide a built-in graphical user interface editing tool and allow for the creation of an unlimited number of control screens with buttons, sliders, gauges, video monitoring windows, LEDs, dynamic text areas and list boxes. Such screens must be able to operate on central computer or any external tablet or regular PC connected via TCP/IP (wired or wireless).

The software can be monitored and be controlled by external application by providing a documented API (Application Programming Interface).

It is possible to balance the program load by splitting the programming in several instances of the software and linking them over IP (without losing synchronization capability). It is also possible to run the same software on multiple computers to provide redundant backup in case of failure of the Master Show Controller.

- Lighting is controlled via DMX, feeding from the Master Show Controller, the ETC Expression console, or the Unison House Light system. The DMX from all sources is merged in highest takes precedence (HTP) manner before being sent to the ETC Sensor dimmers.
- The CDC Projector feeds a Tach pulse to the Timecode Machine, which converts it into Serial data as well as Longitudinal Time Code. LTC is fed to the Timecode card on the Master Show Controller. Serial data from the Timecode Machine is fed to the DTS sound system to synchronize the audio with the film.
- Relays and Digital I/Os provide control and feedback from the CDC Projector and CTI Projection Automation Controller. Event Triggers from the Timecode Machine (which receives them from foil tape on the film) are also sent to the Master Show Controller via Digital I/O. A relay also triggers an Alert Buzzer in the Projection room.

- The Master Show Controller controls the input levels of the DTS, Audio Server, Microphones and CD player in the Soundweb via a Serial port on the GC 100. It controls playback of the Audio Server via TCP/IP and the CD player via an Infrared port on the GC 100.
- Video from the Video Server, DVD Player, Cable Demodulator and VCR are routed through a Chameleon switcher directly to locations in the Gift Shop and Lobby, as well as to video capture cards in the Show Controllers in the Projection Room and Supervisor’s office. The Chameleon also routes video and associated audio to six BlonderTongue RF Modulators, which then combine signals that are sent out to televisions in the museum. The televisions in the museum can be tuned to select from any of these six channels to display the in-house content. The Master Show Controller communicates with the Video Server via TCP/IP and with the DVD Player, Cable Demodulator and VCR via Infrared ports on the GC 100.
- Touch Panels are the preferred interface to the Master Show Controller. In the Upstairs Projection Room, a Medialon Rugboard touch panel provides limited control of the Preshow and Projection system, while the interface in the Downstairs Projection Room is an ELO touch screen connected directly to the Master Show Controller. The Backup Show Controller in the Supervisor’s office can be controlled via mouse and keyboard or it can use an ELO touch screen.

2.1 Redundant Backup

A Redundant Backup Show Controller is configured exactly the same as the Master Show Controller. It can provide instant, seamless backup in the event of failure of the Master Show Controller. The DMX from the Backup is fed into the DMX Merger; the LTC from the Timecode Machine is fed into the Backup, and the Backup is connected to the same IP network as the Master Show Controller, Video Server, Audio Server, GC 100, and a Medialon Rugboard Touch Panel.

The Backup Show Controller uses exactly the same project file as the Master Show Controller, and references an external file to determine whether it should run as Master or Backup. It then monitors the Master Show Controller and all commands and variables. In the event that the Master Show Controller drops offline, the Backup takes control of all devices, operating exactly as the Master Show Controller does, until the Master Show Controller comes back online, when control automatically switches back to the Master.

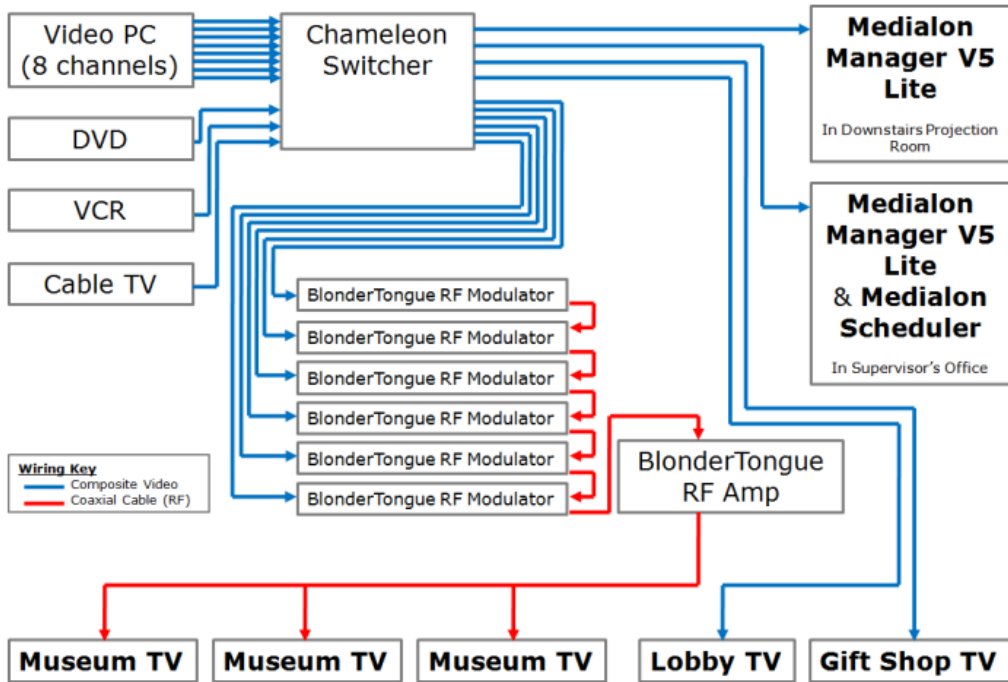
2.2 Creation of Log Files

The Master Show Controller has the function of creating log files to document what happens during every show and what happens when the show is not running (i.e.: in Maintenance mode). Log files can include information about equipment run time, projector lamp hours, equipment malfunctions and operator interaction. It also has the ability to provide Access Control, logging what each user did from each Touch Panel, and locking out unauthorized users.

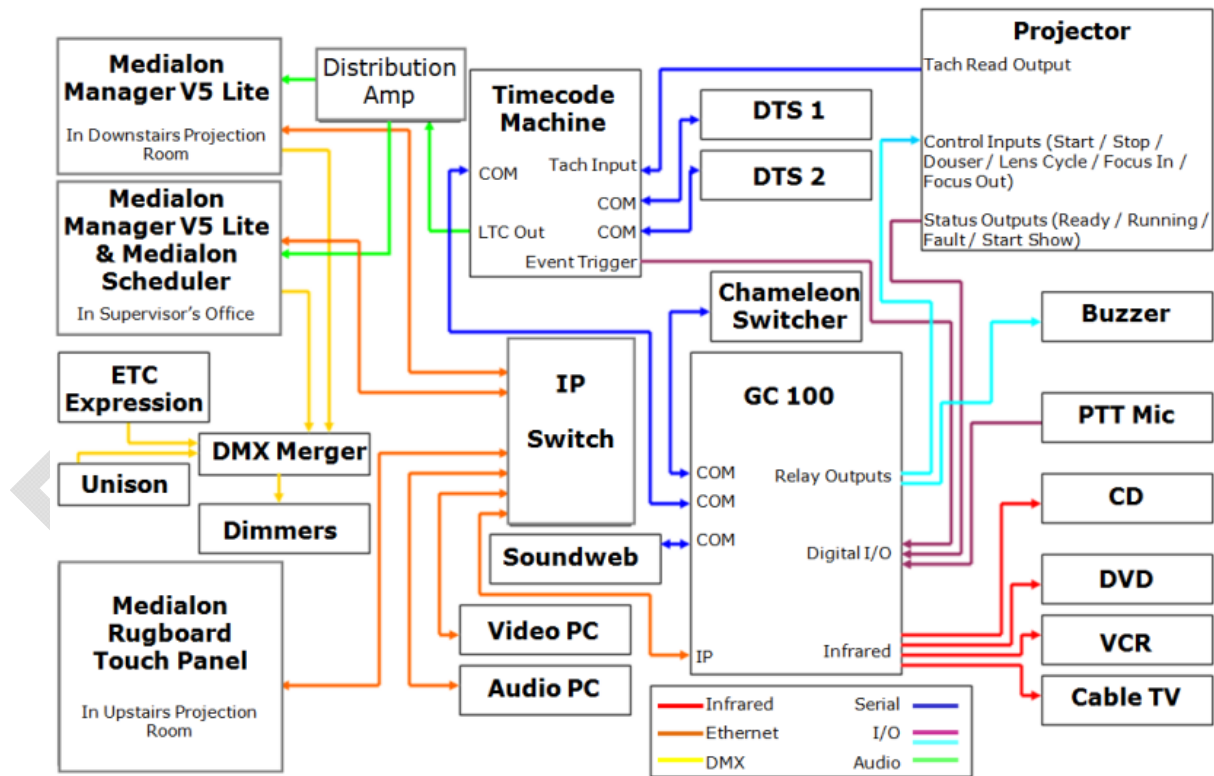
The log files can be stored either in one of the Show Controllers or in separate Network Attached Storage (NAS).

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Block Diagram – Video



Block Diagram - Control



3 Functional Requirements

This chapter describes the functionalities from a user perspective, the work flow.

The user will be able to do the following using the Master Show Controller:

- Start up the system in the morning;
- Run a pre-flight check of all equipment;
- Link to emergency evacuation PA and Fire Alarm systems;
- Monitor video servers, preview and route video;
- Load new video in video servers;
- Reprogram lighting and audio cues and sync to the projection system;
- Load new film audio into the DTS system;
- Perform override or maintenance control and read log files.

4 Graphical user interfaces

All Graphical User Interfaces are designed to look and operate identically, with the exception of the Medialon Rugboard Touch Panel in the Upstairs Projection Room, which is limited to controlling and monitoring only the activity associated with the Dome Theater (i.e. no Video routing capabilities or viewing of system logs).

The Main Show Controller and Backup Show Controller can monitor all variables (including current date and time, projector lamp hours, current film Timecode, routing status of all video sources and destinations, playback status of all video sources, audio input levels, lighting levels, projector status, etc.).

Both Show Controllers can also preview video from any source before routing it to a destination.

Both Show Controllers can log events and store these logs for future review.