BLACK BOX
NETWORK SERVICES

EmeraldSE Network Requirements
Version: B
Last Edited: 1/13/2020

Overview
EmeraldSE will require specific network requirements so that high quality video and low latency are experienced. The technology can utilize unicast and multicast packets, so having a good network backbone that is properly configured is required. Unicast is a protocol designed to send network packets from a single transmitter to a single receiver (*about 40Mbps of bandwidth for Single Head and 80Mbps for Dual-Head*), and Multicast is a protocol designed to send network packets from a single transmitter to more than 1 receiver.

In Unicast mode, every Receiver will need to get 40Mbps of data. This means that with 4 single head Receivers, you are sending a total of (40Mbps x 4 = 160Mbps) from the Transmitter, double that if using Dual-Head.

In Multicast mode, every Receiver will need to get 40Mbps of data still, however the transmitter will send the data once via Multicast and the network switch will then determine who is part of the IGMP group and properly disperse that data to those selected receivers. This is more network switch intensive, but allows for a lot of multimedia data to be transposed across a network of a single or multiple switches.

If using Multicasting technology on a network switch that cannot handle it will result in the network switch taking in the 40Mbps from a transmitter and broadcasting it out to every port whether that device wants the info or not; so selecting the proper network switch that can support Multicasting is extremely important. The network switch that isn't capable of handling this traffic will begin to make every status LED on the switch to blink all at the same time in synchrony, indicating something is wrong.

Recommended Switches
EMS1G48 (48-Port 1Gig Switch) will be capable of handling this type of traffic, whether it is in a single switch or multi-switch setup. You may also use a 10G version EMS10G28 with the LFP416 SFP.

Recommended Network Design
It is best practice to put Transmitters on the same switch as the Receivers who are accessing them most frequently to reduce overhead on the network switch trunks. This isn't always the case though, so placing Transmitters and Receivers on different switches is completely acceptable and it happens a lot; just validate that the switch trunks can handle all the bandwidth.

TCP/UDP Port Usage

	Application	Port	Emerald4K	EmeraldSE/PE/ZU
Appliance				
	Appliance REST HTTP	TCP: 7778	Yes	Yes
	Appliance REST HTTPS	TCP: 8888	Yes	Yes
	Stats gathering Internal Port	TCP: 9998 (internal use only; might show on scan)	Yes	Yes
	Communications	TCP: 22	Yes	Yes
	Manager Discovery (to Appliance): Multicast 224.0.1.249. Appliance listens on UDP Port	UDP: 39150	Yes	Yes
	(4K Only) Default Slave Multicast IP Port (IP: 239.0.0.1)	UDP: 8000	Yes	No
	(4K only) Default Master Multicast IP Port (IP: 239.0.0.1)	UDP: 8001	Yes	No
	Audio (Private/Multi Unicast)	TCP: 9000	Yes (1.2 onwards)	Yes (5.0.x onwards)
	Video EMDSE & 4K	TCP: 16384	Yes	Yes (5.3.x onwards)
	Video, 2nd channel, (Paired only)	TCP: 16385	No	Yes (5.4.x only)
	Reserved – Future	TCP: 16387		
	Reserved – Future	TCP: 16388		
	Multicast 225.0.0.37 (Appliance – recovery)	UDP: 12345	Yes	Yes
	RDP VM & RDP Broker	TCP: 3389 (default)	Yes (Default)	Yes (Default)
	Horizon Client	??		
	TX connections	TCP: 3389	Yes	Yes
Boxilla				
	Boxilla REST HTTPS	TCP: 443		
	Boxilla Smart Proxy HTTP	TCP: 8000 (Boxilla internal only)		
	Communications	TCP: 22		
	Discovery: Multicast 224.0.1.249 (Send)	UDP: 39150		

Note: Firewalls on the WAN may cause audio to fail due to a protocol issue that prevents it traversing some firewalls. The audio channel does not perform the SYN/SYNACK sequence which leads to some of these streams being blocked.

Multi-Subnet Support

EmeraldSE is capable of going over multi-subnets and the internet if properly configured. To go from one subnet to another, you will need to utilize a Layer 3 switch to accommodate the connection (or you may want to consider using VLANs). If going over the internet, you must assign an external IP address to an internal one, and then configure the device to use the internal IP. The Router will know how to handle it if properly configured.

Network Switch Requirements

The following network switch specs are required to handle EmeraldSE Multicasting properly.

Requirement	Switch Setting	Description
Must	IGMP Capable	Usually switches will support IGMP V1, V2, and V3
Must	1Gig Ports	Each port on the switch needs to support 1G for best operation
Recommended	Backplane Support	If you have a Gig 48-Port switch, the backplane should be capable of handling 48Gbps. Some switches will have say 48 ports but the backplane supports 32Gbps.
Must	Switch CPU	The network switch should have a heavy duty CPU that can handle the constant processing on the IGMP groups
Recommended	Jumbo Frames / MTU	Jumbo frames or MTU should be above 9000 bytes, however using a smaller setting may not cause many issues unless you begin seeing horizontal screen tearing or poor video quality.
Recommended	VLAN Configuration	We recommend you setup a VLAN for the EmeraldSE system to keep it separate from other devices on the network. This is not required though, just a suggestion to keep things easy to manage.
Recommended	Switch Trunks	If you plan on using more than 1 network switch, it is a good recommendation to use a switch capable of at least 20 or 40Gbps between switches for optimal performance.

Approved By:

_Garrett Swindell_____   _____Product Engineer_____

Name   (Title)

CURRENT DOCUMENT STATUS	
Document#	N/A
Version	B
File Name	EmeraldSE Network Requirements
Delivery Date	N/A
Owner	Black Box Corporation
Description	Information

REVISION HISTORY				
Revision	**Version**	**Description of Change**	**Changed By**	**Effective Date**
A		Initial Release	GWS	1/29/2019
B		Added TCP/UPD Ports	GWS	1/13/2020