



ATEN HDMI Over IP Video Extender System Implementation Guide

Optimizing Your Network for the VE8900 / VE8950





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1. Introduction

The ATEN VE8900 / VE8950 HDMI over IP Extenders deliver visually lossless 1080p/4K AV signals with low latency over long distance via a standard Gigabit network. The purpose of this guide is to ensure that installation project managers and site administrators are aware of ATEN's best practice guidelines for appropriate network structure and configuration for use with the VE8900 / VE8950 HDMI over IP Extenders. The key elements and recommendations for success, including our suggestions for selecting a suitable network switch, will optimize your installation experience with our products and reduce potential problems.



2. VE8900 / VE8950 Series

The VE8900 / VE8950 provides an effective, easy-to-use and economical digital signage solution with many unique features that directly address the challenges system integrators encounter when implementing AV over IP systems.

- **Limitless flexibility and scalability:**

From a simple point-to-point setup, to thousands of endpoints, the VE8900 / VE8950 offers maximum flexibility and scalability, while offering multi-functionality in extender, splitter, matrix switch, video wall and daisy chain applications.

- **No complicated IP setup:**

Users can effortlessly switch input sources via top panel pushbuttons/ID display, so no IT experience or extra learning is required to set up the relationship matrices.

- **No additional server PCs or software required:**

Manage your AV over IP system by logging in to any receiver or transmitter from the built-in web-based GUI.

- **Go further for less with daisy chaining:**

You can easily expand your AV network coverage without cable clutter while also lowering per-port costs.

Engineered to meet the demands of today's large scale, multi-display 1080p/4K signal transmission requirements, but designed to be uncomplicated to set up and easy to use, the VE8900 / VE8950 is suitable for use in a wide range of environments, including trade shows, airports, university campuses, conference centers, and shopping centers.

3. General Recommendations

The following general recommendations for installing your VE8900 / VE8950 system on a network have been provided here for easy reference.

- **Preparation**

Build and test the rack and test all hardware components before attending the installation site. Doing so will find any issues before moving to the hectic and time sensitive environment of the install itself. Knowing that a unit was working properly before installation makes it far easier to pinpoint the cause of the problem, saving time and money for your business.

- **Power**

Your installation is nothing without power. Use a UPS (Uninterruptible Power Supply) to ensure a clean, consistent power supply to all components in the rack. Be sure to calculate your total load and run time requirements ahead and leave enough room in the rack.

- **Software/Firmware & Tools**

Where possible ATEN ships all components with the most up to date firmware, however before starting any installation please check the downloads section of the products on aten.com to ensure there are no updates to your system components. Also don't forget to [download IP installer](#) – a handy tool to help you identify IPs of your connected units.

All third party hardware also needs to use the latest firmware – particularly switches and TVs. Upgrade instructions please check with the relevant manufacturers.

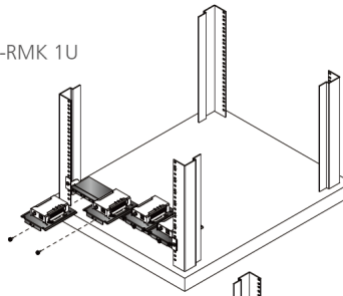
- **Mounting/Installation**

All ATEN products should be mounted so that the logo and text printed on the unit is correctly aligned. This will allow for the optimal airflow through the product. As already stated the vents should not be obstructed with adequate clearance. Units should be secured using suitable fixings. The correct mounting of devices, particularly in the unforgiving environment of an AV or IT rack, is vital to any successful installation and the VE8900/8950.

VE-RMK 1U



VE-RMK 1U





- **Source & Display Settings**

ATEN VE8900/8950 uses the highest quality encoders available to provide visually lossless compression over a large number of displays. However, the compression can only be as good as the source content that is put in. VE8900/8950 uses proprietary compression and supports HDCP 1.4. Thus, please make sure the source content supports HDCP1.4 or is without HDCP encryption. (NOT compatible with HDCP2.2) In addition, please make sure to turn off the video wall function of the display.

Supported Video Resolutions

Resolution	Refresh Rate	Support Model
720x240P	60Hz	VE8900/VE8950
720x288p	50Hz	
480i	50/60Hz 120Hz	
480P	60Hz 120Hz	
1440x480P	60Hz	
576i	50/100Hz	
576P	50/60/100Hz	
720P (1280x720p/1680x720p)	24/25/30/50/60Hz	
1080i	50/60Hz	
1080p (1920x1080p/2560x1080p)	24/25//30/50/60Hz	VE8950
2160p (3840x2160p/4096x2160p)	24/25/30/50/60Hz	



4. Network Design

4.1. Choosing the right Cable

Testing & Certification

ATEN products are manufactured and tested to the highest standards but the best installation environment is paramount to successful installation. The only way to guarantee if the installation is fit for purpose is to test and certify the cables. All IT cable companies will certify cables throughout a network as standard, yet they are passing a fraction of the data in short bursts. Although testing a cable proves that it is correctly terminated, it does not show how much interference on the run is affecting bandwidth. Certification of every cable should always be performed before and after walls are sealed.

Cabling Guidelines

- Ensure source components are located next to encoders with HDMI cables that are as short as possible, as HDMI distances will reduce as content bandwidth increases.
- Use trunking so that cables can be easily replaced down the line.
- Never seal HDMI cables in the wall as they cannot be re-terminated or replaced easily.
- The use of patch panels, wall plates, cable extenders, kinks in cables, and electrical or environmental interference can have an adverse effect on HDMI transmission limiting performance. Steps should be taken to minimize these factors (or remove completely) during installation for best results.

ATEN Suggested cables & Accessories

2L-7D05H
5 m High Speed HDMI Cable
with Ethernet



2L-7D03H
3 m High Speed HDMI Cable
with Ethernet



2L-7D02H-1
2 m High Speed HDMI Cable
with Ethernet



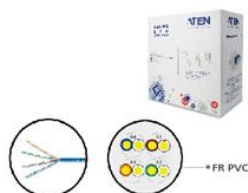
2L-2910

305M HDBaseT SF/UTP CAT 6
Cable



2L-2801

305M Low Skew Cat 5e Cable



Compatible Accessories

2X-EA12

LockPro - HDMI Cable Lock





4.2. Choosing a Network Switch

This section provides various general and specific recommendations for switches to use with VE8900 / VE8950. However, there is no substitute for testing in real world situations. If you are in doubt about which network switch to use, the safest approach is to select one from the list of recommended switches below.

The Basics

In general, the network switches deployed in VE8900 / VE8950 installation must support the following:

- Gigabit (or faster) Ethernet port
- Multicast forwarding or filtering
- IGMP v2 Snooping (multicast)
- Support for jumbo frames (packets) up to 9216-byte size
- IGMP Snooping
- IGMP Querier
- IGMP Snooping Fast-Leave
- High bandwidth connection between switches

Types of High Performance Switch

A high performance network switch is the means of a successful VE setup. When choosing a network switch, first select the type:

Layer 2 or Layer 3 Switches

You will need to determine whether you need a layer 2 or a layer 3 switch for your VE network. Layer 3 switches cost more than layer 2 switches because they are more complex and handle more network traffic. The best way to calculate which type of switch you need is to first determine if you will have a dedicated network for the VE devices or if the VE devices will be on a network that shares throughput with other network equipment such as computers, servers and printers. If they share the network with other devices its best to consider a layer 3 switch and use layer 2 switches exclusively for the VE device connections. For larger installations we recommend using Layer 3 switches.

The major differences are:

- Layer 3 Switch:
IP addresses in packets are examined and intelligent forwarding decisions are made. On a larger network broken into subnets across long distances, a layer 3 switch becomes the best choice as they can improve network efficiency and provide better traffic flow. They are better at directing more traffic to different locations on a larger more complex network, and with layer two switches working below them.



- **Layer 2 Switch:**

Packets are examined and forwarded using only the MAC address. If you have a small central network, a layer 2 switch should do the job. If the network is exclusive and will only transmit the bandwidth of VE devices, layer 2 switches with the correct settings can get the job done effectively.

Further Considerations

Number of ports: Choose a switch that has enough ports to match the number of VE devices you will be installing. Switches typically come in 5, 8, 10, 16, 24, 28, 48, and 52-port configurations. If you are installing 13 VE transmitters and 13 VE receivers, you will need to purchase a switch with at least 28 ports.

Stackable verse Standalone

Stackable switches allow you to easily manage and configure ports spanning across multiple switches that the VE devices are connected through. This provides a centralized method to configure and troubleshoot the initial setup of VE devices on a network which makes fine tuning the bandwidth, data throughput and video quality easier. Stackable switches can be configured to direct the VE transmissions between many units more specifically and effectively. Standalone switches provide the same configuration features as Stackable switches but they must be set individually. Stackable switches provide an easy way to manage multiple switches, as one unit. For example, instead of configuring, managing, and troubleshooting 6 28- port switches individually, you can manage the six as if they are a single unit using Stackable Switches. The six switches (168 ports) function as a single switch and are managed from one web or GUI interface.

What Stackable Switches Can Do:

- Create a link aggregation group with one port in one unit of the stack and another port of that group in another switch in the stack.
- Select a port on one switch in the stack and mirror the traffic to a switch port on another unit of the stack; thus copy the configuration to direct traffic more effectively between VE devices.
- Apply custom ACL security settings to any port on any switch in the stack.

Stackable switches can be setup in a ring configuration, so that if a port or cable fails, the stack automatically routes around the failure, at microsecond speeds. Stackable Switches also allow you to add and remove stack “members” which are automatically updated and recognized as such.



Recommended Switches

The following models have been tested and found to produce favorable results:

Manufacturer	Model
D-Link	DGS-1510
Cisco	SG300
	Catalyst 2960-XR
	Catalyst 2960-X
Netgear	GS724T
	M4300-28G
	M4300-52G
H3C	5120 Series
Edgecore Networks	ECS-4120-52T

4.3. Planning Network Architecture

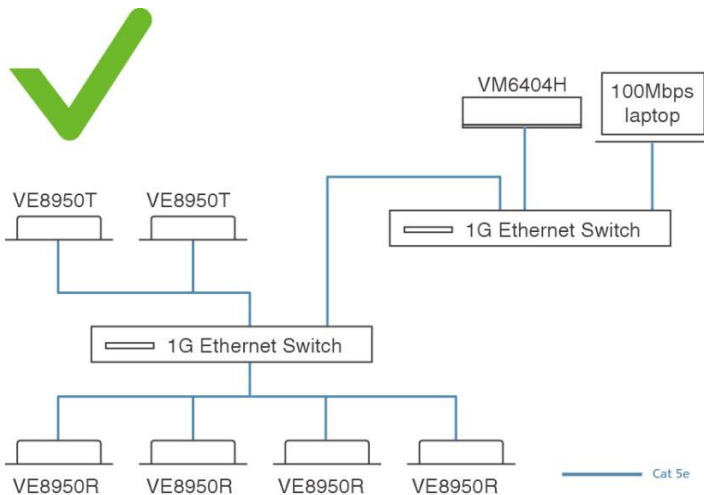
Build Strategies

For optimum performance, the VE extenders require high amounts of data to be transferred across a network; therefore we recommend the following strategies to setup the VE devices. Using our suggestions will provide better performance and the highest video resolutions possible. Use each of the keys to ensure the best transmission of data and the highest throughput possible. Prior to setup we recommended laying out the plans for your VE installation using the following performance guide

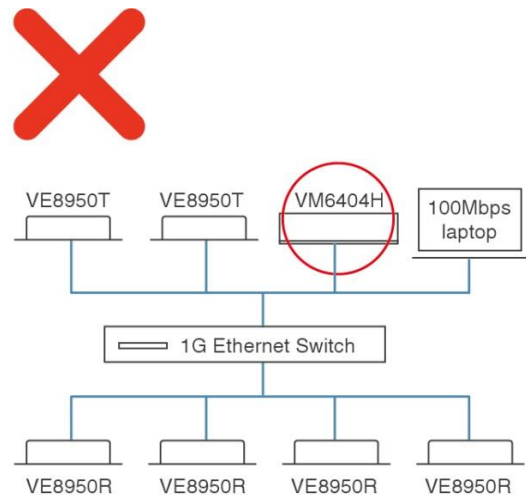
- **Build a Network Diagram**
To build an effective VE installation, start by mapping out the layout. Create a diagram with the VE devices, computers and routers along with how they will be connected across the network. It also helps to write out how the devices will interact. Use the diagrams below as the framework as you decide what devices to purchase and how to build the network effectively for the best data throughput.

Considerations:

- Use a flat cascaded layout (basic line cascaded structure) and avoid a tree or pyramid structure
- Limit cascades to two levels
- Install network switches as near to each other as possible
- Minimize the distance of all connections
- Ensure sufficient bandwidth between the switches to eliminate bottlenecks
- For optimum performance, the VE8900 / VE8950 units should be on dedicated network
- Ensure that all the VE8900 / VE8950 units you want to manage are located within the same subnet
- It is not recommended to locate any other devices within the same subnet as the VE8900 / VE8950 units. See diagram below for reference:



This setup provides the smoothest performance



This setup might cause frame drops, blinking, ping or packet loss

• Determine the Distance:

Distance is an important factor when setting up networks, with a shorter distance and fewer hops through routers, data can be transmitted more efficiently. So whenever possible decrease the distance and direct network traffic effectively between subnets that communicate with each other to increase the data throughput.

• Ensure the Bandwidth:

Ensuring the bandwidth ahead of time will guarantee performance before installing VE devices on a network. This will eliminate the primary cause of problems related to video quality and transmission of data. If the speed is right at all ends of your network, then the only other causes are derived from device failure or limits caused by a router, switch or device setting.

Cascaded Switch Networking

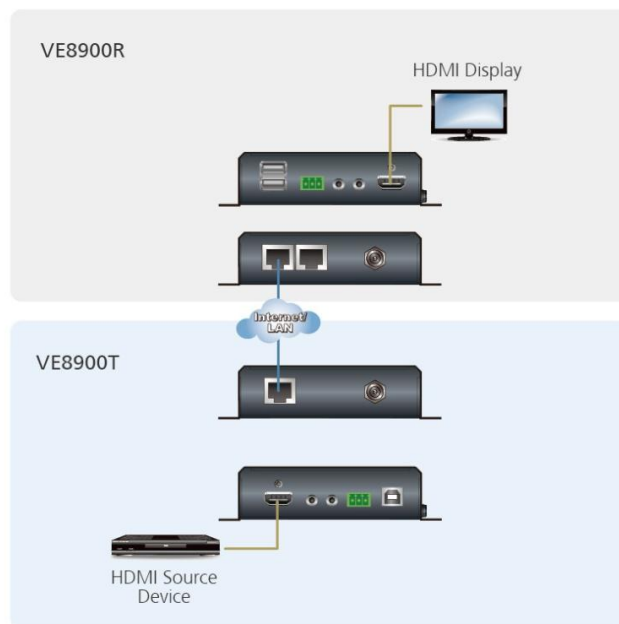
If more devices are required, it is recommended to cascade switches. Assuming a typical transmitter bitrate of 150~500Mbps, we recommend using network switches with **10Gbs** connections for bidirectional data flow between the core and extended switches.

4.4 Network Setup Examples

One Transmitter to One Receiver

A single transmitter and receiver can be linked directly or via the LAN, to send video from a source to a display in another location. If linked directly the CAT5e/6 cable linking them should not run more than 100m/328ft.

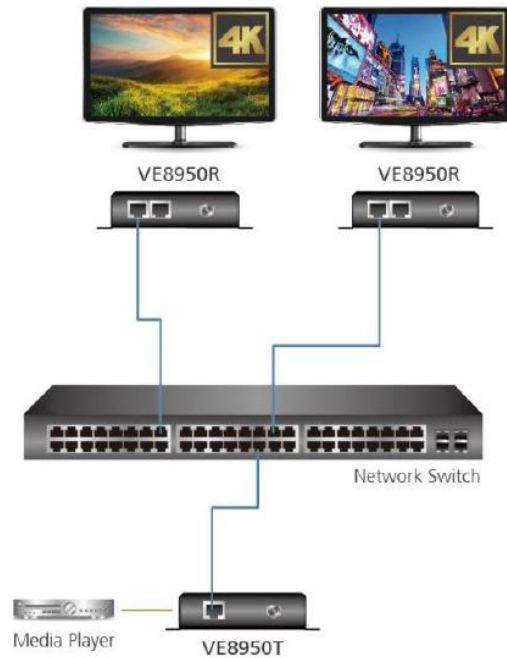
The devices will not automatically connect and must first be selected receiver ID number matched with transmitter ID number to establish the link.



One Transmitter to Multiple Receivers

Using VE8900 / VE8950 for one-to-many installations dramatically decreases the amount of equipment required at the source location, each transmitter can be located up to 100m/355ft from the switch.

- Scenario A (with Ethernet switch)



- Scenario B (without Ethernet switch)

In a single source input scenario for video splitter application, the distance between receivers (point-to-point) can be up to 100m.



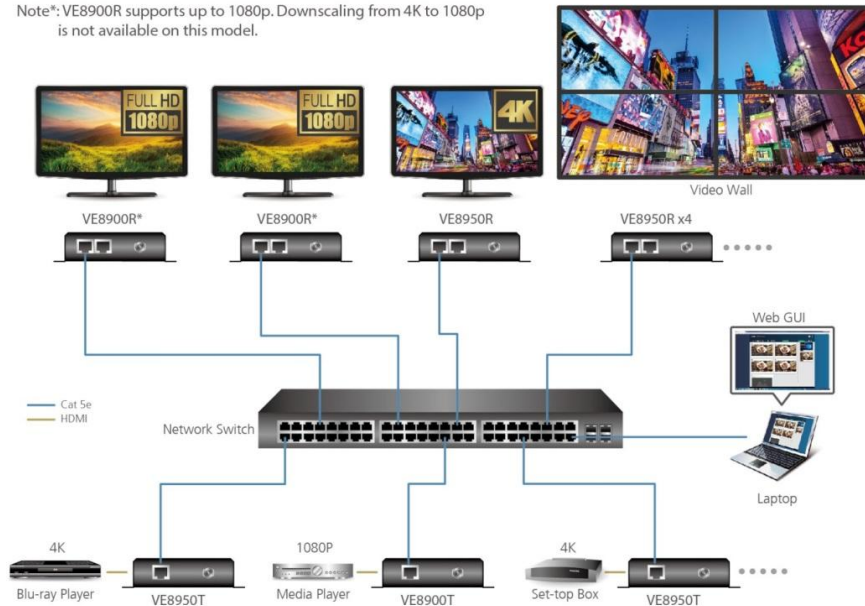
Multiple Transmitters to Multiple Receivers

The truly modular nature of the VE8900 / 8950 over IP topology allows an AV distribution of almost any number of sources and displays.

Video Wall

The versatility of VE8900 / VE8950's powerful video wall functionality lets a collection of displays to display multiple images or a single image and any combination in between. Supports up to 16 x 16 wall with image rotation and portrait video walls, as well as traditional landscape modes. Easily switch layout profiles, preview and drag-and-drop video sources via the intuitive web-based GUI.

Note*: VE8900R supports up to 1080p. Downscaling from 4K to 1080p is not available on this model.



4.5. Configuring the Network Switch

IGMP and Other Settings

Configuring the switch correctly will pass data more efficiently, allowing a better stream across the network to each VE device. The following settings will help optimize your network traffic through a switch:

- Enable Flow Control
- Enable IGMP Snooping on L2 switches
- Enable IGMP Querier on the L3 switch
- Enable IGMP Fast-Leave on all switches where VE units are directly connected
- Enable Jumbo frames (Jumbo packets) in order to correctly convey the necessary data
- Enable Spanning Tree Protocol (STP) on all switches and enable Portfast exclusively on switch ports that have VE units connected
- Pick an appropriate forwarding mode on all switches. Use Cut-through if available, or Store and Forward



The following table shows the recommended settings for various networking topologies:

Switch Feature	Single Switch Networking	Cascaded Switch Networking	
		Core Switch	Extended Switch
Green or energy-saving	Disable	Disable	Disable
Multicast forwarding / filtering	Enable	Enable	Enable
IP Address of IGMP Querier	Must be assigned a valid value		N/A
Jumbo frames	Enable	Enable	Enable
IGMP Snooping	Enable	Enable	Enable
IGMP Querier	Enable	Enable	Disable
IGMP Snooping fast leave	Enable	Disable	Enable

Note: Please refer to your switch's user guide as different brands and models may have different names for these features