VERSA-4K

4K Video & USB Over IP

4.1



March 28, 2023

TABLE OF CONTENTS

1.0 INTRODUCTION 3

Examples 3

2.0 VERSA-4K BANDWIDTH REQUIREMENTS 3

3.0 NETWORK SWITCH REQUIREMENTS 4

Minimum Network Switch Requirements 4

4.0 SINGLE SWITCH CONFIGURATION 4

Example 1: 10 Senders and 14 Receivers setup using SG350-28P: 4

Example 2: 8 Senders and 40 Receivers setup using SG350-52P 4

5.0 STACKED SWITCH CONFIGURATION 5

Example 3: 10 Senders and 182 Receivers setup using SG350X-48P 5

Example 4: 20 Senders and 172 Receivers setup using SG350X-48P 6

Example 5: 40 Senders and 384 Receivers setup using SX550X-52 7

6.0 COMMON MISTAKES WHILE CONFIGURING SWITCH 8

7.0 REFERENCE 9

1.0 INTRODUCTION

Integrators usually face problems while configuring network switches for AV over IP solutions as the terminology and steps to configure a switch not only varies with each manufacturer but also depends on the number of Senders and Receivers in the system. This document provides guidelines to select and configure a Network Switch for VERSA-4K system for various small and large scale deployments with Examples. We also suggested some Network Switches that we tested and required minimum configuration to achieve the system requirements. Also, refer to Section 6.0 - Common mistakes while configuring switch for more information.

Note:

All the examples presented here uses absolute maximum bandwidth required by VERSA-4K, which means that each Sender is extending 4K Video at visually lossless, 4x USB 2.0 Devices; also keyboard and mouse. In general, the number of senders can be doubled if the system is just extending the video. Also, Video bandwidth usage on each Sender can be limited up to 25Mbps. Refer VERSA-4K User manual for more information.

Examples:

1	10 Senders and 14 Receivers setup using SG350-28P
2	8 Senders and 40 Receivers setup using SG350-52P
3	10 Senders and 182 Receivers setup using SG350X-48P
4	20 Senders and 172 Receivers setup using SG350X-48P
5	40 Senders and 384 Receivers setup using SX550X-52

2.0 VERSA-4K BANDWIDTH REQUIREMENTS

To configure a Network Switch for the VERSA-4K System, one must be aware of the bandwidth requirements. For proper operation, one must use a Network Switch that can provide such bandwidth.

VERSA-4K Bandwidth Requirements:

Typical 1080p Video	Up to 250Mbps
Video + USB2.0	850Mbps
Maximum Bandwidth	< 1Gbps

The bandwidth of VERSA-4K system depends on the number of senders used in the system. See formula below.

*Bandwidth Required = Number of Senders * 1Gbps*

For example -

If your system has 10 Senders (***VERSA-4K-S***) a network switch with 10Gbps bandwidth, ***"Switch Bandwidth",*** is necessary.

3.0 NETWORK SWITCH REQUIREMENTS

Minimum Network Switch Requirements:

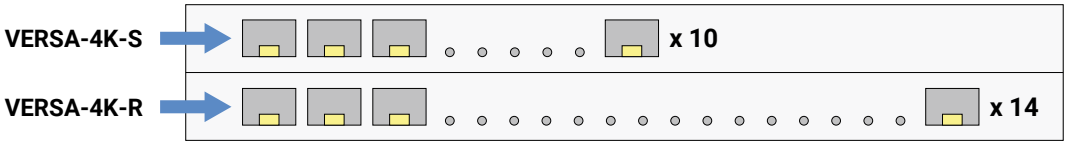
1. IGMPV2
2. JUMBO Frame - *8K*
3. Gigabit Ethernet
4. DHCP Server - *optional* *VERSA-4K supports auto-IP
5. PoE - *optional*
6. Stack + LAG Support for more robust installations

A Network Switch is the critical part of VERSA-4K system as the scalability and performance of the system depends on the switch configuration. We recommend an Isolated Managed Network Switch or a Dedicated VLAN on an existing network. Jumbo Frame is required for 4K video, however, in VERSA-4K it is enabled by default. IGMPV2 is always required if you have more than one sender.

4.0 SINGLE SWITCH CONFIGURATION

Single Switch Configuration is widely used in a smaller installation where the number of devices is less than or equal to the total number of available ports on the Network Switch. While using Single Switch configuration one must consider the Switch bandwidth (Sometimes referred to as “Switch Capacity” or “Switch Fabric Capacity”). Secondly, IGMP and JUMBO frame must be enabled.

Example 1: 10 Senders and 14 Receivers setup using SG350-28P



VERSA-4K System Bandwidth Requirements:

Bandwidth required for 10 Senders/20 Receivers	10 Gbps

From the datasheet of **SG350-52P**:

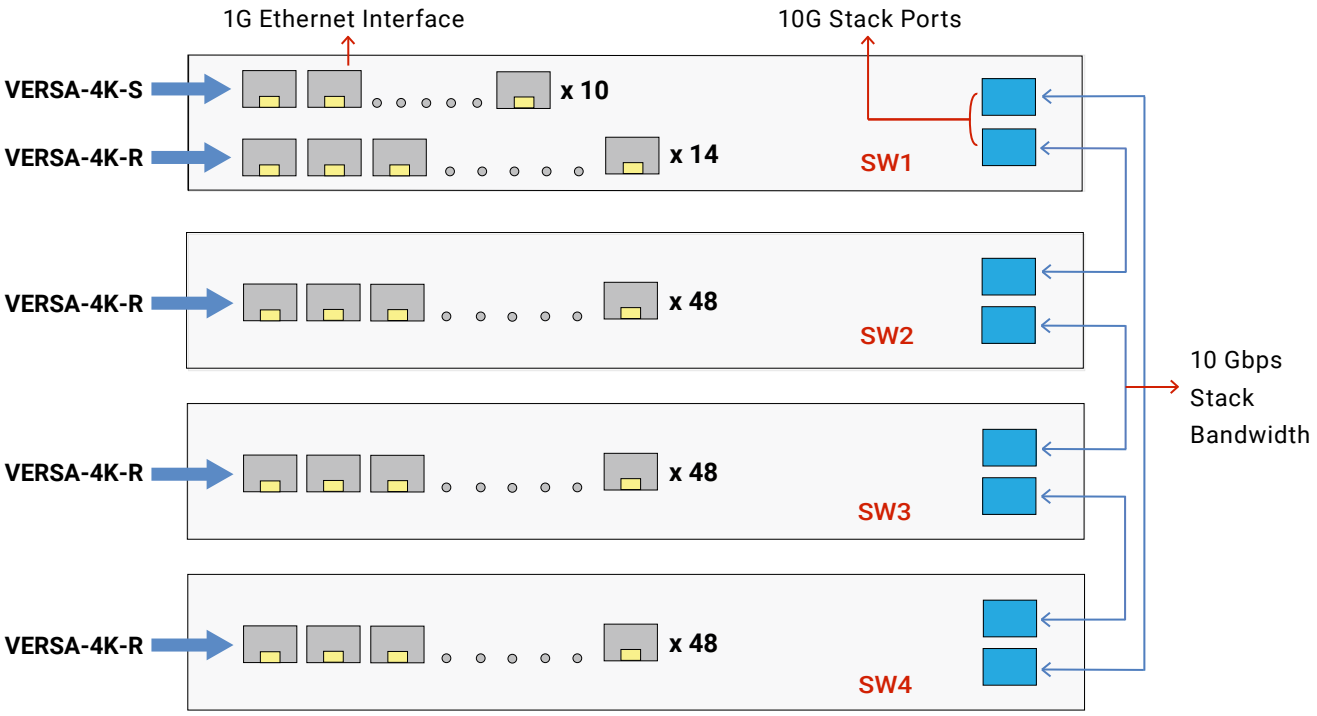
Switching Capacity inGigabits per Second (Gbps)	56 Gbps
Number of PoE ports	24
Number of 1G Ethernet Interfaces	26
IGMP Querier	Yes
IGMPV2	Yes
IGMP Snooping	Yes
Jumbo Frame Support	Up to 9K
DHCP Server	Yes

This configuration shows 10 Sender and 20 Receivers. Although the switch has enough bandwidth to server up to 50 Senders, there are only 26 Ethernet Ports available on the switch out of only 24 supports PoE.

5.0 STACKED SWITCH CONFIGURATION

In Stacked Switch configuration, multiple switches operate as one logical unit. This simplifies network management. Stacked switches are connected using Stack Ports. These special ports can be either Copper or SFP. Stack ports typically operate at 10G Interfaces. The Example shown below uses Ring Topology to add more redundancy to the system. When using more than 10 Senders, multiple Stack links are needed to push the 10G barrier. This is achieved using LAGs - Link Aggregate Groups. LAGs allows the grouping of multiple ports in order to increase bandwidth. Like VLAN, the stack ports must be configured as Stack Port and grouped as LAGs, as by default they operate as regular network interfaces.

Example 3: 10 Senders and 182 Receivers setup using SG350X-48P



Where:

SW1, SW2, SW3, SW4	Cisco SG350X-48P

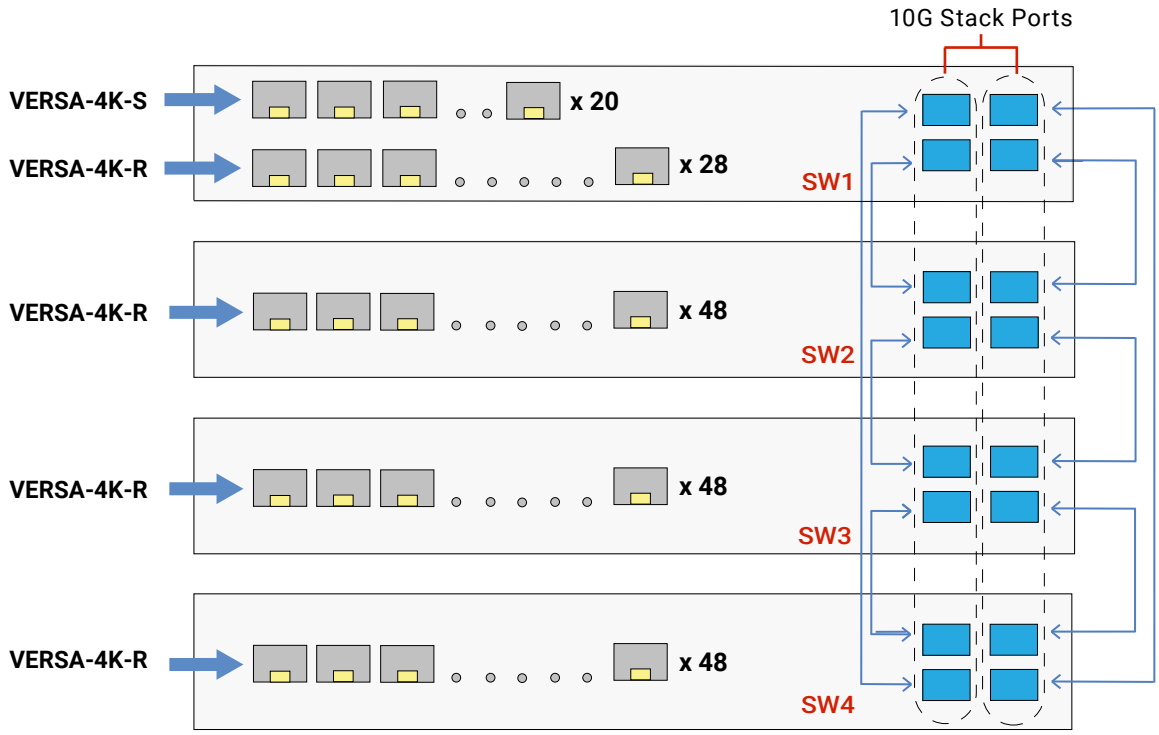
Example 3: 10 Senders and 182 Receivers setup using SG350X-48P

Number of Senders on SW1	10
Number of Receivers on SW1	38
Number of receivers on each switch (SW2, SW3, SW4)	48
Total Bandwidth Required	10Gbps
Stack Bandwidth Required	10 Gbps

Number of 1G Interfaces with PoE	48
Maximum number of switches that can be stacked	4
Number of 10G Stack Port	4 (2x10GE + 2xSFP)
Total Stack Bandwidth achieved using two Stack Ports	10Gbps

The number of senders on SW1 is limited to only 10 because we are only using two stack ports on each switch. See Example 4, which uses all the four stack port on SG350X-48P.

Example 4: 20 Senders and 172 Receivers setup using SG350X-48P



Where:

SW1, SW2, SW3, SW4	Cisco SG350X-48P

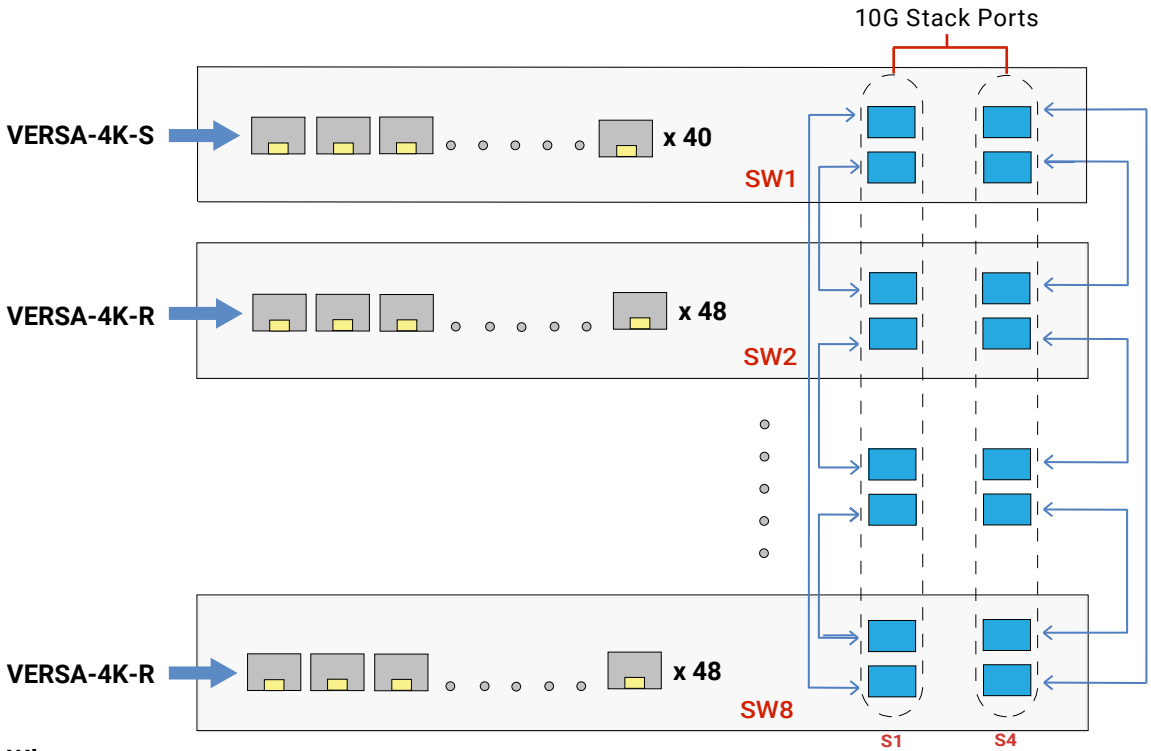
VERSA-4K System Bandwidth Requirements:

Number of Senders on SW1	20
Number of Receivers on SW1	28
Number of receivers on each switch (SW2, SW3, SW4)	48
Total Bandwidth Required	20Gbps
Stack Bandwidth Required	20Gbps

Number of 1GE Interfaces available	48
Maximum number of switches that can be stacked	4
Number of 10G Stack Port	4 (2x10GE + 2xSFP)
Total Stack Bandwidth achieved using four Stack Ports	20Gbps

The number of senders on SW1 is limited to only 10 because we are only using two stack ports on each switch. See Example 4, which uses all the four stack port on SG350X-48P.

Example 5: 40 Senders and 384 Receivers setup using SX550X-52



Where:

SW1, SW2, SW3, SW4	Cisco SX550X-52

VERSA-4K System Bandwidth Requirements:

Number of Senders on SW1	40
Number of receivers on each switch (SW2, SW3, SW4)	48
Bandwidth Required for 40 Senders	40Gbps
LAG Stack Bandwidth Required	40Gbps

Number of 1GE Interfaces available	48
Maximum number of switches that can be stacked	4
Number of 10G Stack Port	4 (2x10GE + 2xSFP)
Total Stack Bandwidth achieved using four Stack Ports	20Gbps

6.0 COMMON MISTAKES WHILE CONFIGURING SWITCH

1. A network switch rated as Gigabit does not mean all the ports support Gigabit Ethernet.
2. A network switch with all Gigabit Ethernet ports doesn't mean that it can switch 1G data on all the ports simultaneously. A switch should have enough bandwidth to switch the packets coming from all the ports. This is also referred to as Switch Fabric Capacity / Switch Bandwidth.
3. IGMPV2 requires at least one IGMP querier, which is also called a Multicast Router in the network. IGMP will not work without IGMP Querier. Lack of IGMP will cause the multicast traffic to flood on all the ports. .Lack of IGMP not only makes the Network inefficient but also degrades the performance of the senders, which is not meant to receive any Video traffic.
4. When switches are stacked, each switch in the chain should support IGMP Snooping and should include one IGMP querier in the network. In general, both managed and unmanaged switches support IGMP Snooping. Many managed switches have built in querier and support snooping capability. So, using only managed switches would be an easier option. Some older switches that only support IGMP Snooping required static configuration to IGMP querier IP address as they cannot auto-detect the querier.
5. IGMP Proxy is not an IGMP querier, it is used to relay the IGMP messages to the IGMP querier on different networks.
6. If a switch has multiple VLANs, IGMPV2 must be enabled in each VLAN.
7. When stacking switches, the total stack must have enough Stack Bandwidth to support all the Senders in the network.
8. Not all the ports can be used as Stack Ports and there is a limit on number switches that are stacked. Please refer to the switch manufacturer datasheet before installing the Stacked Switch Configuration.
9. In a stacked configuration each member in the stack should have a unique Stack ID.
10. Note that you cannot stack different brands of switches together. Please refer to the switch manufacturer datasheet before installing the Stacked Switch Configuration.

7.0 REFERENCE:

1. VERSA-4K User Manual
https://halltechav.com/wp-content/uploads/product/VERSA-4K/downloads/Versa-4K_Manual_Feb9-2023.pdf

2. Cisco 350 Series Managed Switches Datasheet
https://www.cisco.com/c/en/us/products/collateral/switches/small-business-smart-switches/data-sheet-c78-737359.html

3. Cisco 350X Series Stackable Managed Switches Datasheet
https://www.cisco.com/c/en/us/products/collateral/switches/350x-series-stackable-managed-switches/datasheet-c78-735986.html

4. Cisco 550X Series Stackable Managed Switches Datasheet
https://www.cisco.com/c/en/us/products/collateral/switches/550x-series-stackable-managed-switches/datasheet-c78-735874.html

5. IGMP configuration on the SG350 and SG550
https://www.cisco.com/c/en/us/support/docs/smb/switches/cisco-350-series-managed-switches/smb5292-igmp-snooping-on-the-sg350-and-sg550.html

6. Configure Stack Settings on an SG350X Switch
https://www.cisco.com/c/en/us/support/docs/smb/switches/cisco-350x-series-stackable-managed-switches/smb5408-configure-stack-settings-on-an-sg350x-switch.html

7. Configuring Link Aggregation Groups on the SG350XG and SG550XG
https://www.cisco.com/c/en/us/support/docs/smb/switches/cisco-350x-series-stackable-managed-switches/smb5098-configuring-link-aggregation-groups-on-the-sg350xg-and-sg550.htmlt



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