Design a 144-port SDVoE system with M4300 switches

Modular. Scalable. Unique.

M4300 Series Switches

Application Notes
How to build a 144-port system
The 144-port switch concept

In many applications, a single Ethernet switch is sufficient to displace a single matrix switch. It makes a very compelling proposal when a 16x16 matrix switch, consuming 440 watts and seven rack units of space can be replaced by a 48-port Ethernet switch in a single rack unit, consuming only 161 watts.

But sometimes a single switch isn’t enough – whether you’re using matrix switching or AV over IP. In these cases, the scalability of Ethernet makes AV over IP shine. Plus, as systems grow larger and larger, the cost advantage of AV over IP compared to the traditional matrix switch grows quickly.

This document will provide a specific and easy to follow example of how to create a 144-port SDVoE AV over IP system using the NETGEAR M4300-96X switch as a base. The system we will create here is fully non-blocking (meaning any possible mapping of inputs to outputs may be deployed at any time). This table makes a simple comparison of the cost of this 144-port system. The SDVoE system is 36% cheaper and uses 75% less space in the rack.

| “Brand C” 144 port matrix switch |
|---|---|---|
| **Quantity** | **Part** | **Cost** |
| 1 | 128x128 matrix chassis | $72,000 |
| 9 | 8-input 1080p fiber blade | $9,000 |
| 9 | 8-output 1080p fiber blade | $9,000 |
| 72 | 1080p fiber transmitter | $1,800 |
| 72 | 1080p fiber receiver with scaler | $1,800 |
| **Total cost** | | $493,200 |
| **Rack space consumed** | | 24 RU |
| **End to end latency** | | Less than one millisecond |

| NETGEAR and ZeeVee 144-port SDVoE system |
|---|---|---|
| **Quantity** | **Part** | **Cost** |
| 3 | NETGEAR M4300-96X 96-port fiber switch | $9,599 |
| 72 | ZeeVee Zyper 4K HDMI 2.0 Fiber Encoder with multiview (Z4KENC3) | $1,800 |
| 72 | ZeeVee Zyper 4K HDMI 2.0 Fiber Decoder with video wall (Z4KDEC3) | $1,800 |
| **Total cost** | | $287,997 |
| **Rack space consumed** | | 6 RU |
| **End to end latency** | | Less than one millisecond |

SDVoE cost savings vs matrix switch: 42%
SDVoE space savings vs matrix switch: 75%
Interconnecting three NETGEAR M4300-96X series switches

To create an even larger network system, three (3) M4300-96X switches can be interconnected in a stack for 144 x non-blocking 10G ports.

The figure below shows an example where six (6) 40G ports are used between switches for three times 240Gbps bi-directional bandwidth in a ring topology:

<table>
<thead>
<tr>
<th>Switch 1</th>
<th>Switch 2</th>
<th>Switch 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 x SDVoE TX</td>
<td>24 x SDVoE RX</td>
<td>24 x SDVoE TX</td>
</tr>
<tr>
<td>6 x 40G Stacking Ports</td>
<td>6 x 40G Stacking Ports</td>
<td>6 x 40G Stacking Ports</td>
</tr>
</tbody>
</table>

Switch 1 and Switch 2 are interconnected using total of six (6) 40G links
Switch 2 and Switch 3 are interconnected using total of six (6) 40G links
Switch 3 and Switch 1 are interconnected using total of six (6) 40G links

In each switch, bottom slots 7-12 are populated with APM402XL port cards (2-port 40G QSFP+ each). This results in a 144-port stack configuration with 8-port 10G port cards (copper, fiber, or PoE) in upper slots 1-6, each time. This topology is non-blocking when TX and RX devices are evenly distributed across the three switches.
For this example, you can refer to the application note called “M4300_Series_How to stack NETGEAR M4300 switches” to learn more about NETGEAR M4300 stacking. The same few things must be considered:

- Take note of which slots and which ports will be used for the interconnect
- Decide which switch will be the master, the backup management unit and the member unit
- Use switch CLI or Web GUI interfaces to configure each switch

**Create the 144-port stack using CLI**

**Step 1: Login to first switch, assign priority and configure stack ports in slots 7 to 12**

```plaintext
User:admin
Password:
(M4300-96X) >enable
(M4300-96X) #config
(M4300-96X) (Config)#switch 1 priority 15
(M4300-96X) (Config)#stack
(M4300-96X) (Config-stack)#stack-port 1/7/1 stack
(M4300-96X) (Config-stack)#stack-port 1/7/5 stack
(M4300-96X) (Config-stack)#stack-port 1/8/1 stack
(M4300-96X) (Config-stack)#stack-port 1/8/5 stack
(M4300-96X) (Config-stack)#stack-port 1/9/1 stack
(M4300-96X) (Config-stack)#stack-port 1/9/5 stack
(M4300-96X) (Config-stack)#stack-port 1/10/1 stack
(M4300-96X) (Config-stack)#stack-port 1/10/5 stack
(M4300-96X) (Config-stack)#stack-port 1/11/1 stack
(M4300-96X) (Config-stack)#stack-port 1/11/5 stack
(M4300-96X) (Config-stack)#stack-port 1/12/1 stack
(M4300-96X) (Config-stack)#stack-port 1/12/5 stack
(M4300-96X) (Config-stack)#exit
(M4300-96X) (Config)#exit
(M4300-96X) #save
```
Step 2: Login to second switch, assign priority and configure stack ports in slots 7 to 12

User: admin
Password:
(M4300-96X) >enable
(M4300-96X) #config
(M4300-96X) (Config)#switch 1 priority 10
(M4300-96X) (Config)#stack
(M4300-96X) (Config-stack)#stack-port 1/7/1 stack
(M4300-96X) (Config-stack)#stack-port 1/7/5 stack
(M4300-96X) (Config-stack)#stack-port 1/8/1 stack
(M4300-96X) (Config-stack)#stack-port 1/8/5 stack
(M4300-96X) (Config-stack)#stack-port 1/9/1 stack
(M4300-96X) (Config-stack)#stack-port 1/9/5 stack
(M4300-96X) (Config-stack)#stack-port 1/10/1 stack
(M4300-96X) (Config-stack)#stack-port 1/10/5 stack
(M4300-96X) (Config-stack)#stack-port 1/11/1 stack
(M4300-96X) (Config-stack)#stack-port 1/11/5 stack
(M4300-96X) (Config-stack)#stack-port 1/12/1 stack
(M4300-96X) (Config-stack)#stack-port 1/12/5 stack
(M4300-96X) (Config-stack)#exit
(M4300-96X) (Config)#exit
(M4300-96X) #save

Step 3: Login to third switch, assign priority and configure stack ports in slots 7 to 12

User: admin
Password:
(M4300-96X) >enable
(M4300-96X) #config
(M4300-96X) (Config)#switch 1 priority 1
(M4300-96X) (Config)#stack
(M4300-96X) (Config-stack)#stack-port 1/7/1 stack
(M4300-96X) (Config-stack)#stack-port 1/7/5 stack
(M4300-96X) (Config-stack)#stack-port 1/8/1 stack
(M4300-96X) (Config-stack)#stack-port 1/8/5 stack
(M4300-96X) (Config-stack)#stack-port 1/9/1 stack
(M4300-96X) (Config-stack)#stack-port 1/9/5 stack
(M4300-96X) (Config-stack)#stack-port 1/10/1 stack
(M4300-96X) (Config-stack)#stack-port 1/10/5 stack
(M4300-96X) (Config-stack)#stack-port 1/11/1 stack
(M4300-96X) (Config-stack)#stack-port 1/11/5 stack
(M4300-96X) (Config-stack)#stack-port 1/12/1 stack
(M4300-96X) (Config-stack)#stack-port 1/12/5 stack
(M4300-96X) (Config-stack)#exit
(M4300-96X) (Config)#exit
(M4300-96X) #save

Step 4: Reload (reboot) the first switch

User: admin
Password:
(M4300-96X) >enable
(M4300-96X) #reload
Step 5: While the first switch is booting, connect the stacking cables (in this case, 40GBASE-CR4 QSFP+ to QSFP+ DAC cables, or fiber 40GBASE-SR4 MMF, or 40GBASE-LR4 SMF QSFP+ transceivers) in between the three switches.

Step 6: While the first switch is still booting, reload (reboot) the second switch.

User: admin
Password: 
(M4300-96X) >enable
(M4300-96X) #reload

Step 7: While the second switch is still booting, reload (reboot) the third switch.

User: admin
Password: 
(M4300-96X) >enable
(M4300-96X) #reload

Step 8: Check the stack, after third switch has started, connecting to the console via the first switch:

User: admin
Password: 
(M4300-96X) >enable
(M4300-96X) #show switch

<table>
<thead>
<tr>
<th>SW</th>
<th>Switch</th>
<th>Status</th>
<th>Preconfig Model ID</th>
<th>Plugged-in Model ID</th>
<th>Switch Status</th>
<th>Code Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mgmt Sw</td>
<td></td>
<td>M4300-96X</td>
<td>M4300-96X</td>
<td>OK</td>
<td>12.x.x.x</td>
</tr>
<tr>
<td>2</td>
<td>Stack Mbr</td>
<td>Oper Stby</td>
<td>M4300-96X</td>
<td>M4300-96X</td>
<td>OK</td>
<td>12.x.x.x</td>
</tr>
<tr>
<td>3</td>
<td>Stack Mbr</td>
<td></td>
<td>M4300-96X</td>
<td>M4300-96X</td>
<td>OK</td>
<td>12.x.x.x</td>
</tr>
</tbody>
</table>
Conclusion: Cost-effective M4300 switches for SDVoE installations

As a proud founding member of the SDVoE Alliance, NETGEAR has designed the M4300 switches for true AV-over-IP, enabling cost-effective integration and Zero-Touch install of SDVoE systems. IGMP is pre-configured for you, and all M4300 models stack together for scale and convenience.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>XSM4316S</th>
<th>XSM4324S</th>
<th>XSM4324CS</th>
<th>XSM4348S</th>
<th>XSM4348CS</th>
<th>XSM4396K0 (empty)</th>
<th>XSM4396K1 (starter kit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1G/10G SFP+</td>
<td>-</td>
<td>Up to 24 ports</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Up to 24 ports</td>
<td>-</td>
</tr>
<tr>
<td>Form Factor</td>
<td>Half-width</td>
<td>Full width</td>
<td>Modular</td>
<td>Full width</td>
<td>Modular</td>
<td>Modular 2 bays</td>
<td>Modular 2 bays</td>
</tr>
<tr>
<td>Rack Mount</td>
<td>1-unit in 1U or 2-unit in 1U</td>
<td>1-unit in 1U</td>
<td>1-unit in 2U</td>
<td>1-unit in 1U</td>
<td>1-unit in 2U</td>
<td>1-unit in 2U</td>
<td>1-unit in 2U</td>
</tr>
<tr>
<td>Power Supply</td>
<td>Modular 1 bay</td>
<td>Modular 1 bay</td>
<td>Modular 1 bay</td>
<td>Modular 2 bays</td>
<td>Modular 2 bays</td>
<td>Modular 2 bays</td>
<td>Modular 2 bays</td>
</tr>
<tr>
<td>Included PSU</td>
<td>(1) APS250W</td>
<td>XSM4396K0...no PSU</td>
<td>XSM4396K1... (1) APS600W</td>
<td>XSM4396K0...no PSU</td>
<td>XSM4396K1... (1) APS600W</td>
<td>XSM4396K0...no PSU</td>
<td>XSM4396K1... (1) APS600W</td>
</tr>
</tbody>
</table>

Indicative pricing and warranty:

To configure your M4300-96X, check out [www.netgear.com/96x-config](http://www.netgear.com/96x-config)
To learn more, check out [www.netgear.com/sdvoe](http://www.netgear.com/sdvoe) and [www.sdvoe.org](http://www.sdvoe.org)

NETGEAR, the NETGEAR logo and ProSAFE are trademarks and/or registered trademarks of NETGEAR, Inc. and/or its subsidiaries in the United States and/or other countries. SDVoE is a trademark of the SDVoE Alliance. Information is subject to change without notice. ©2018 NETGEAR, Inc. All rights reserved.