## Revisions

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1. Objective
The objective of this short guide is to provide a short guideline as far as what networking pre-requisite(s) is/are concerned when deploying a single or multi Dell EMC VxRail cluster.

2. VxRail Network Topologies and Networking Requirements
The Dell EMC VxRail is not your traditional Dell EMC server. It is a standalone appliance consisting of storage and compute. It leverages VMware vSphere and VMware vSAN components to provide server virtualization and software-defined-storage.

There are two major VxRail network deployment topologies, Layer 2 and Layer 3. Within these two topologies, there could be a single site/rack connected to a single top of rack (ToR) switch or multiple sites/racks with their respective top of rack switches connected to a pair of core/spine switches (see Figure 2).

The Dell EMC VxRail appliance has four specific predefined network traffic types: management, vSphere vMotion, vSAN, and virtual machines. As such, specific vlans must be configured and assigned to each type of traffic.

Depending on the type of VxRail deployment, the network infrastructure requirements will change.

- Layer 2 – In this type of deployment, all user, storage, and management traffic are configured to be part of their own individual VLAN or broadcast domain.
- Hybrid (Layer 2 and Layer 3) – In this type of deployment, multi-racks belonging to different subnets, that need to communicate with each other use Layer 3 to route between the different subnets, at the same time, Layer 2 is carried and stretched across the spine/core layer.

3. Layer 2
A layer 2 network topology is the simplest of the topologies being discussed. It is a flat network, it consists of a single VLAN or broadcast domain or a set of VLANs for each specific type of traffic (management, vSAN, vMotion, and VMs).

Figure 1 captures a single site/rack VxRail network topology using VxRail pre 4.5 and after. In this topology, there are three network features that need to be configured on the networking device, i.e. top-of-rack switch(es):

1. **VLAN tagged** – All the different types of traffic (management, vMotion, vSAN, VMs) being generated must reach the networking devices as tagged VLAN, in this case VLANs 20 - 50 (see Figure 1). This traffic needs to be switched by the top-of-rack switch. If the switch is not configured appropriately to accept and switch this traffic, all VxRail traffic is dropped at the top-of-rack switch.

2. **Trunk** – The trunk concept within networking defines a physical switch port configured as a trunk to carry multiple VLANs or subnets. This switch port is directly connected to the ESX host that is part of the VxRail cluster.
3. **Layer 2 multicast IGMP Snooping & Querier** – With VxRail, two of the traffic types (management and vSAN) rely lightly on multicast traffic to discover each other as a cluster is brought up. However, it should be noted that this multicast traffic is very small and if it is flooded then no performance is affected.

(a) **Management VLAN** – The VxRail appliances use multicast to discover each other in the network. The communication protocol used to discover each other is VMware’s Loudmouth auto-discovery capabilities. As new VxRail nodes are deployed in the network they advertise themselves using IPv6 multicast. This behavior is limited to the management VLAN the nodes use for communication. The configuration of IPv6 multicast is an *optional* configuration. It is a best practice to further minimize the small or negligible amount of multicast traffic.

(b) **vSAN VLAN** – Similar to the management VLAN, multicast configuration is optional. If IGMP Snooping is enabled, then IGMP Querier should also be enabled. If the infrastructure does not support multicast, then vSAN VLAN traffic will be flooded, the amount is very small and it really will not affect the performance of VxRail. It is recommended to enable IGMP Snooping and Querier if supported, but is not necessary.

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Figure 1  **Layer 2 Topology, Single site/rack VxRail**

Figure 2 shows a multi-site/racks VxRail topology. In this topology, an additional networking layer is being introduced. A core/spine layer is used to interconnect the different racks connected to the top-of-rack switches.

In this new topology two additional networking features on top of the features being configured for a single site/rack need to be configured on the networking devices (ToR/leaf and Core/Spine).

1. **VLAN tagged** – see single site/rack network configuration.
2. **Trunk** – see single site/rack network configuration.
3. **Layer 2 multicast IGMP Snooping & Querier** – see single site/rack network configuration.
4. **Link Aggregation** – In a multi-site/rack, the ToRs switches connect to another upper networking layer (Core/Spine). These connections are bundled to achieve greater link bandwidth as well as redundancy.

5. **Chassis Redundancy** – In order to achieve full link aggregation from the ToRs, the core/spine switches must appear as a single virtual switch. To achieve this VLT (Virtual Link Trunk) must be configured on the core/spine switches.

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**Figure 2** Layer 2 Topology, multiple site/rack, pre-VxRail 4.5 and after

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4. **Hybrid (Layer 2 & Layer 3)**

Figure 3 shows a VxRail topology using a hybrid switch interconnection configuration (Layer 2 & Layer 3)

In this case, different VxRail clusters belong to different subnets as a result, management, vSAN, vMotion and VM traffic that wish to communicate with each other must be routed. Starting with vSphere 6.0 vmkernel interfaces can override the default TCP/IP stack allowing to define a different default gateway for each of these traffic services (management, vSAN, vMotion, etc.)

The hybrid interconnect allows layer 2 traffic as well. For traffic that does not need to be routed, only extended, the interconnect is a simple trunk stretching a layer 2 domain across the sites or racks.

An additional networking feature is enabled in this topology.

1. **IP PIM Multicast** – PIM is configured on the core/spine switches. PIM is the multicast routing protocol used to route between the different IGMP groups and it replaces the need to configure an IGMP querier.
5. Conclusion

Both VxRail topologies (Layer 2 and Hybrid) are straight-forward and require very little networking configurations. These networking configurations depend whether VxRail version 4.5 or earlier is being used.

As a recommendation, VxRail 4.5 and later versions should be used since the need for multicast is removed, this in itself is a great benefit as it greatly simplifies the network design.

For additional information and full deployment document(s), please check out the following documents:

http://www.storagereview.com/dell_emc_vxrail_overview