



HD NVR NIC Teaming Overview

Avigilon™ HD NVR

HD-NVR3-PRM

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Introduction

Purpose

The purpose of this document is to provide an overview of the switch independent, active/standby Network Interface Controller (NIC) teaming strategy and its configuration details as recommended by Avigilon for the HD NVR.

Scope

This overview discusses the benefits, setup details, expected behavior, and the limitations that arise when implementing the switch independent, active/standby NIC teaming strategy. This NIC teaming strategy is used with the intent of providing redundancy when the HD NVR is connected to two segmented networks or subnets with one camera network and one client network.

NOTE: NIC teams that provide bandwidth aggregation require switch-side configuration. These types of network topologies are not supported and are outside the scope of this document.

Audience

This document is intended to be used by installers who want to set up their HD NVR with the switch independent, active/standby NIC teaming configuration.

Design and Implementation

Link Aggregation Overview

Link aggregation is a method used to aggregate more than one physical NIC into a single logical group which behaves as if it were a single NIC. The logical group has its own modified IP address, but it uses the MAC address of a group member. The native implementation of link aggregation in Windows Server 2012 R2 is called NIC teaming.

When NIC teaming is aggregated using a suitable configuration, it can provide one or both of the following benefits:

- Failover during NIC failure → Increased availability
- Increased performance → Load sharing and bandwidth aggregation

Native NIC teaming in Windows Server 2012 R2 without any switch-side configuration does not allow bandwidth aggregation. The NIC teaming strategy supported on the HD NVR does not require any configuration other than the configuration done in Windows.

Recommended Strategy

The recommended NIC teaming strategy is switch independent, active/standby.

Switch independent means that the NIC team does not need to be confined to one switch and switch-side configuration is not required. In Windows Server 2012 R2, this strategy assumes that teams will have exactly two essential NICs.

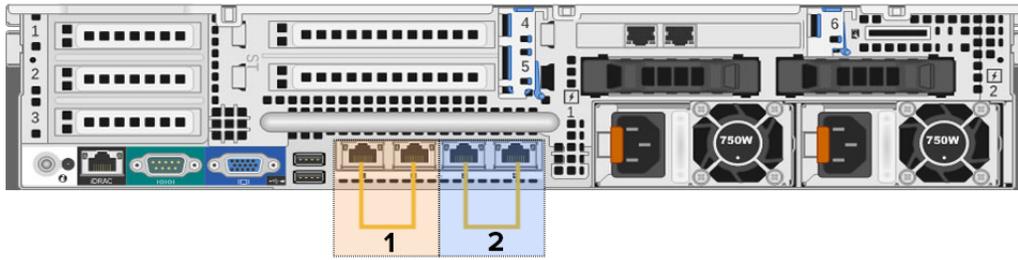
Active/standby means that the NIC team operates with one NIC active and all other team members in standby mode. The active NIC serves all traffic for the NIC team, while those in standby mode transfer no data.

When the active NIC is not functioning, another team member becomes the active NIC and takes over all network traffic for its NIC team. By default in Windows Server 2012 R2, the NIC reverts to standby mode only when the designated active NIC functions again. This fail-back behavior makes it easy to identify when the NIC team is in its optimal state or when traffic is being routed through a NIC that is normally on standby.

Port Configuration

1GbE NICs

The recommended server NIC teaming configuration uses two NIC teams that include two 1GbE NICs per team. A sample topology using this strategy is outlined below:



NIC Team	Network Segment
1	Camera Network (incoming data)
2	Client Network (outgoing data)

10GbE NICs

It is possible to configure one NIC team comprised of two 10GbE NICs. NIC teams involving 10GbE NICs are configured in a similar way to those involving 1GbE NICs.

NOTE: The HD-NVR3-PRM currently provides two 10GbE NICs.

Combining one or more 10GbE NICs in a team with one or more 1GbE NICs will limit the speed of the teamed 10GbE NICs to match the speed of the 1GbE NICs. A requirement for NIC teaming is that all NICs have to be of the same speed.

Failover Behavior and Limitations

Upon failure of the active NIC, network traffic will failover to the standby NIC and data transfer interruption will be mitigated. The described NIC teaming configuration will provide redundancy in the event that a NIC fails or in the event that one NIC per connected network segment fails.

During a failover event, data transfer is taken over immediately by the standby NIC with minimal packet loss. When the active NIC resumes functioning, it carefully takes over data transfer from the standby NIC with no packet loss.

The IP address of the NIC team is shared by all team members. During a failover event, Windows Server 2012 handles the hand-off of the NIC team IP address and MAC address assignment.

The following limitations arise when using this NIC teaming configuration:

- Bandwidth aggregation is not provided.
- Failure of two NICs on one network connection will result in a network interruption.
- Only two networks can be connected to the NVR using 1GbE ports.
- The server will experience some packet loss during a failover event.

This NIC teaming topology is useful for providing NIC redundancy and graceful failover of network traffic in the event of a NIC failure. Other scenarios are not provided for this configuration.

Recommended Configuration Details

1GbE NICs

When configuring NIC teams consisting of 1GbE NICs using the load balancing and failover admin utility in Windows Server 2012 R2, the following configurations are recommended for the two NIC teams.

For the first NIC team, use the following configuration details when adding a new team:

Team name	NIC Team #1
Member adapters	NIC1. NIC2
Teaming mode	Switch Independent
Load balancing mode	Address Hash
Standby adapter	NIC2

For the second NIC team, use the following configuration details when adding a new team:

Team name	NIC Team #2
Member adapters	NIC3. NIC4
Teaming mode	Switch Independent
Load balancing mode	Address Hash
Standby adapter	NIC4

10GbE NICs

When configuring NIC teams comprised of 10GbE NICs using the load balancing and failover admin utility in Windows Server 2012 R2, the following configurations are recommended:

Team name	10GbE NIC Team
Member adapters	SLOT3 Port 1, SLOT 3 Port 2
Teaming mode	Switch Independent
Load balancing mode	Address Hash
Standby adapter	SLOT 3 Port 2

The Teaming mode is set to Switch Independent because the other options for teaming mode require some degree of switch-side configuration. Also, setting the Teaming mode to Switch Independent removes the requirement that all NIC team members must connect to the same switch, allowing for a wider range of possible network topologies.

The load balancing refers to how packets are distributed across a NIC team. The Load balancing mode is set to Address Hash so that no CPU cycles are used for functionality intended for virtual machines. This is because virtual machines are not used on HD NVRs.