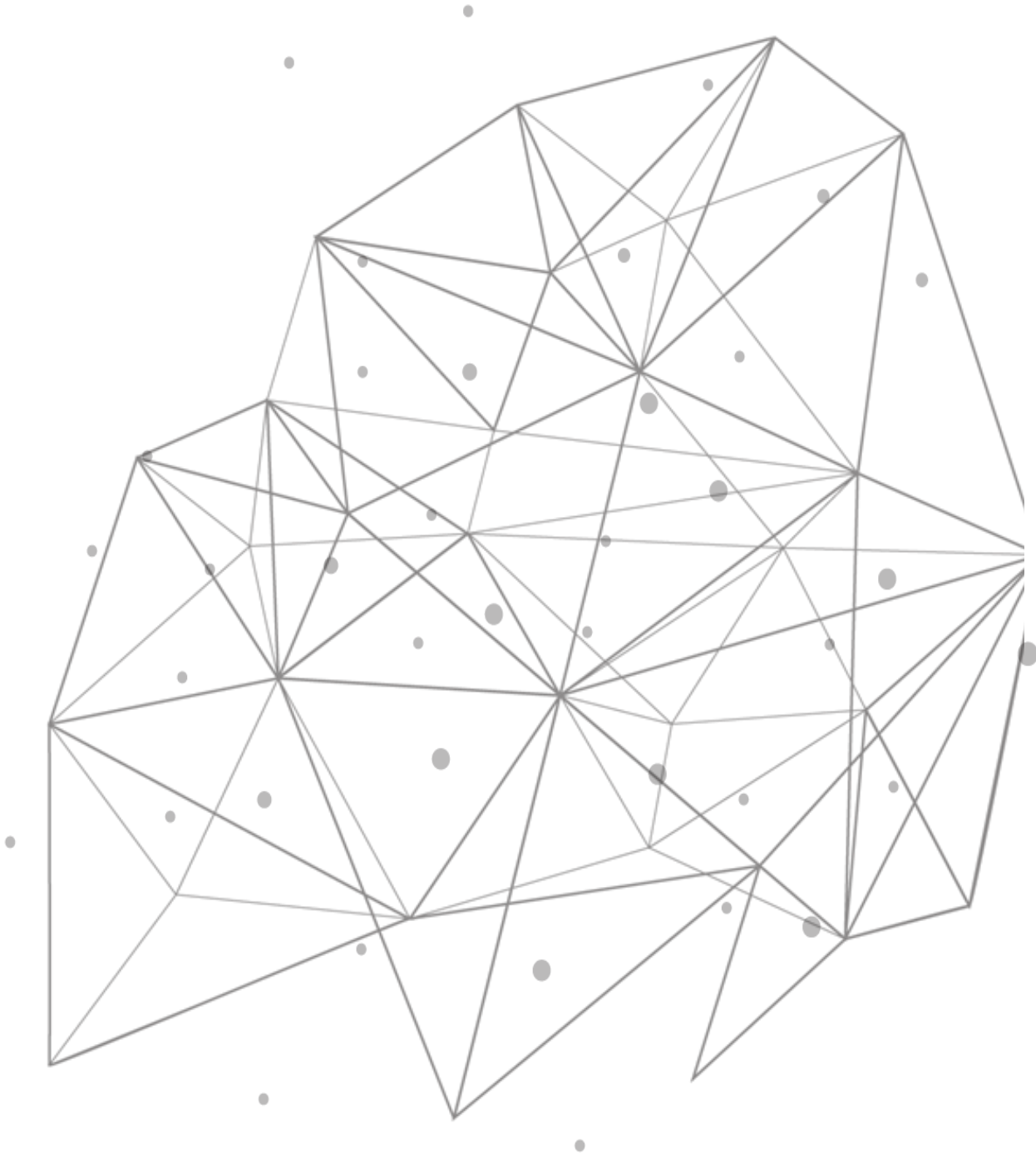


NIC Bonding On TCPWave Appliances



Introduction

In the modern world of technology, service continuity and network redundancy are necessary. Therefore, keeping the core network services like DNS and DHCP up and running is extremely important. To make that happen NIC bonding, or teaming can be used.

NIC Bonding

Network bonding is a method of combining or joining two or more network interfaces into a single interface. It offers enhancements and redundancy by increasing the network throughput and bandwidth. If one interface is down or disconnected, the other one will work. It can be used when you need fault tolerance, redundancy, or load balancing networks. In Linux, a particular kernel module named bonding connects multiple network interfaces into a single interface. Two or more network interfaces can be combined into a specific logical “bonded” interface. The conduct of the bonded interfaces depends on the type of bonding method used.

NIC Bonding in TCPWave Environment

- If the TCPWave appliance is connected to one NIC and if this connection happens to be faulty, then the name resolution in the enterprise could experience a potential disruption of service. To avoid a single point of failure (SPOF) from a network connectivity perspective, a dual NIC model with a logical bonding is recommended by the seasoned DNS architects and engineers. This is a best practice. A properly engineered solution would be that an appliance needs to be connected to different redundant switches, with a logical NIC referencing two physical NICs via a bonding method listed in the table below. Performing this activity will ensure the network naming and provisioning services (DNS and DHCP) operate at a 100% SLA (Service Level Agreement)
- TCPWave provides an extra edge facility of the NIC bonding to the network administrators to serve multiple NICs with the same IP address.

NIC Bonding Configuration

In NIC bonding, different parameters need to be defined, such as mode and extra attributes.

Types of Network Bonding

Mode	Policy	Description	Fault Tolerance	Load balancing
0	Round Robin	In this mode, the packets are sequentially transferred or received through each interface one by one.	No	Yes
1	Active Backup	In this mode, one NIC is active and the other NIC is inactive. If the active NIC goes down, the other NIC becomes active. This mode is supported in x86	Yes	No

Mode	Policy	Description	Fault Tolerance	Load balancing
		environments.		
2	XOR [exclusive OR]	In this mode, the MAC address of the slave NIC is matched up against the incoming request's MAC. Once the system establishes the connection, the same NIC is used to transmit or receive for the destination MAC.	Yes	Yes
3	Broadcast	In this mode, all the transmissions are sent on all slaves	Yes	No
4	Dynamic Link Aggregation	In this mode, the aggregated NICs act as one NIC which results in higher throughput, but also provides failover in the case that a NIC fails. Dynamic Link Aggregation requires a switch that supports IEEE 802.3ad.	Yes	Yes
5	Transmit Load Balancing (TLB)	In this mode, the outgoing traffic is distributed depending on the current load on each slave interface. Incoming traffic is received by the current slave. If the receiving slave fails, then the other slave takes over the MAC address of the failed slave.	Yes	Yes
6	Adaptive	Unlike Dynamic	Yes	Yes

Mode	Policy	Description	Fault Tolerance	Load balancing
	Load Balancing (ALB)	<p>Link Aggregation, Adaptive Load Balancing does not require any particular switch configuration.</p> <p>Adaptive Load Balancing is only supported in x86 environments. The receiving packets are load-balanced through ARP negotiation.</p>		

Additional Parameters Configuration

In the network interface configuration, the following parameters need to be defined:

- ONBOOT=yes
- NM_CONTROLLED=no
- BOOTPROTO=static

To configure the NIC bonding on TCPWave appliances, the network administrators must enable additional interfaces. By default, a TCPWave appliance has eth0 as its management interface. Users can configure additional NICs from the TCPWave IPAM GUI.

Note: Ensure the interfaces are connected to switch ports in the case of hardware appliances. In the case of VM, ensure the required interfaces are added to the VM in the Virtual environment.

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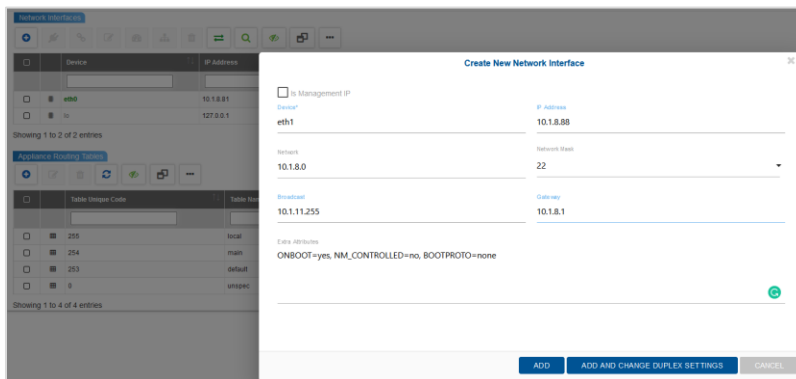
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
   link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
   inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
   inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
   link/ether 00:50:56:8f:c4:f5 brd ff:ff:ff:ff:ff:ff
   inet 10.1.8.81/22 brd 10.1.11.255 scope global eth0
       valid_lft forever preferred_lft forever
   inet6 fe80::250:56ff:fe8f:c4f5/64 scope link
       valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
   link/ether 00:50:56:8f:42:1a brd ff:ff:ff:ff:ff:ff
   inet6 fe80::250:56ff:fe8f:421a/64 scope link
       valid_lft forever preferred_lft forever
4: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
   link/ether 00:50:56:8f:2e:48 brd ff:ff:ff:ff:ff:ff
   inet6 fe80::250:56ff:fe8f:2e48/64 scope link
       valid_lft forever preferred_lft forever

```

To configure NIC from the GUI:

- Navigate to Network Management >> DNS/DHCP/IPAM Management >> TCPWave Appliances >> Network Configuration tab.

- Click sync network interface [] and select the option IPAM to Remote, the system updates the network interface configurations on the TCPWave appliance.
- Click to add the interface. Add the configuration as shown in the below screenshot. Ensure the following while adding an interface for an appliance from IPAM.
 - The device name must start with 'eth'.
 - IP Address must not be pingable.
 - One IP Address cannot be associated with two or more NICs.
 - If the IP address has already been defined as an object type - TCPWave Remote/TCPWave IPAM, then network, mask, broadcast fields are auto-populated.

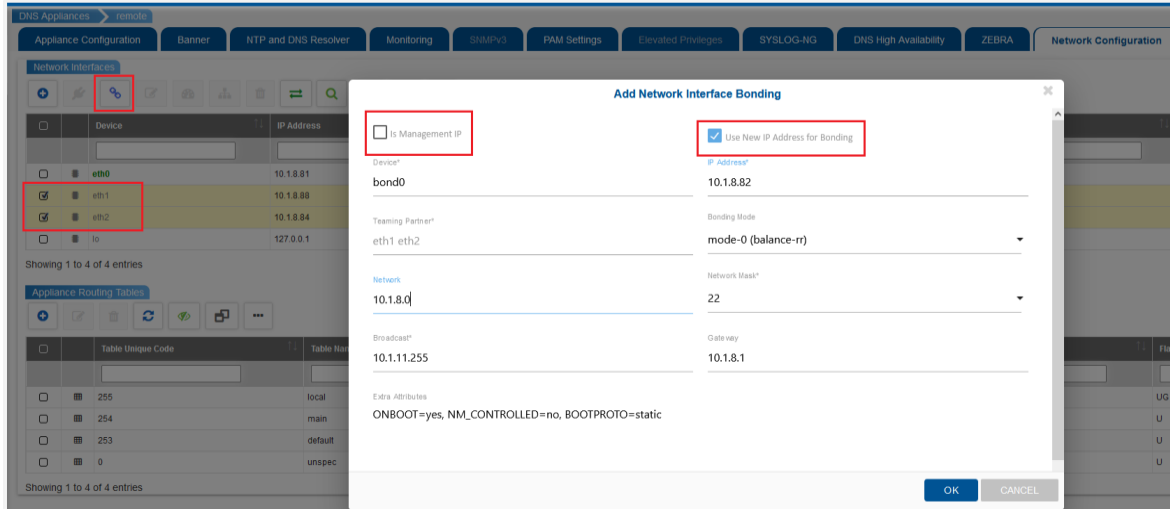


- Click OK to save the network configuration.

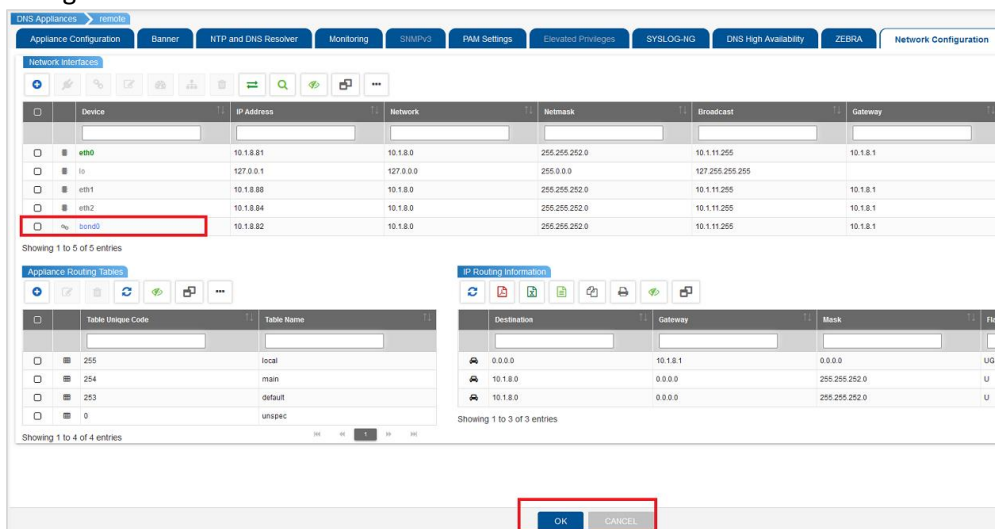
Device	IP Address	Network	Network Mask	Broadcast	Gateway	Speed	Duplex
eth0	10.1.8.1	10.1.8.0	255.255.252.0	10.1.11.255	10.1.8.1	default	default
eth1	10.1.8.1	10.1.8.0	255.255.252.0	10.1.11.255	10.1.8.1	default	default
eth2	10.1.8.4	10.1.8.0	255.255.252.0	10.1.11.255	10.1.8.1	default	default

Creating Bonded Interface

- To create NIC bonding, select the two interfaces that need to be bonded (use the Ctrl key for choosing multiple interfaces).
- Click and add bondX interface details.
- Select the “Is Management IP check-box to use the bonded interface as the management interface.
- If you want to use another IP address altogether as bonded interface IP, use the check box “use New IP address for bonding, else choose one of the interface’s IPs as bonded interface IP.



- Click OK to save the network interface bonding. The system displays the bonded interface configuration as shown.



Conclusion

Network resiliency is an extremely critical component to accommodate for, while planning a robust and fault-tolerant DDI ecosystem. Provisioning an additional layer of resiliency at the network connectivity level by clubbing two physical interfaces into a bonded interface will eliminate a disruption caused due to a bad network port, a bad cable or a switch failure etc. The seamless integration and the ease of use, that's engineered in the core TCPWave IPAM makes it a relatively simple task to perform engineering with perfection. To learn more about NIC configuration, contact the [TCPWave Sales Team](#).