View network information

ONTAP 9

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Table of Contents

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Overview

You can view information related to ports, LIFs, routes, failover rules, failover groups, firewall rules, DNS, NIS, and connections.

This information can be useful in situations such as reconfiguring networking settings, or when troubleshooting the cluster.

If you are a cluster administrator, you can view all the available networking information. If you are an SVM administrator, you can view only the information related to your assigned SVMs.

Display network port information (cluster administrators only)

You can display information about a specific port, or about all ports on all nodes in the cluster.

About this task

The following information is displayed:

- Node name
- Port name
- IPspace name
- Broadcast domain name
- Link status (up or down)
- MTU setting
- Port speed setting and operational status (1 gigabit or 10 gigabits per second)
- Auto-negotiation setting (true or false)
- Duplex mode and operational status (half or full)
- The port's interface group, if applicable
- The port's VLAN tag information, if applicable
- The port's health status (health or degraded)
- Reasons for a port being marked as degraded

If data for a field is not available (for example, the operational duplex and speed for an inactive port would not be available), the field value is listed as `-`.

Step

Display network port information by using the `network port show` command.

You can display detailed information for each port by specifying the `-instance` parameter, or get specific information by specifying field names using the `-fields` parameter.

```
network port show
Node: node1

Ignore
                                                  Speed(Mbps) Health
Health
Port      IPspace      Broadcast Domain Link MTU  Admin/Oper  Status
Status
--------- ------------ ---------------- ---- ---- ----------- --------
------
e0a       Cluster      Cluster          up   9000  auto/1000  healthy
false
e0b       Cluster      Cluster          up   9000  auto/1000  healthy
false
e0c       Default      Default          up   1500  auto/1000  degraded
false
e0d       Default      Default          up   1500  auto/1000  degraded
true
Node: node2

Ignore
                                                  Speed(Mbps) Health
Health
Port      IPspace      Broadcast Domain Link MTU  Admin/Oper  Status
Status
--------- ------------ ---------------- ---- ---- ----------- --------
------
e0a       Cluster      Cluster          up   9000  auto/1000  healthy
false
e0b       Cluster      Cluster          up   9000  auto/1000  healthy
false
e0c       Default      Default          up   1500  auto/1000  healthy
false
e0d       Default      Default          up   1500  auto/1000  healthy
false
8 entries were displayed.
```

Display information about a VLAN (cluster administrators only)

You can display information about a specific VLAN or about all VLANs in the cluster.

About this task

You can display detailed information for each VLAN by specifying the `-instance` parameter. You can display

specific information by specifying field names using the `-fields` parameter.

Step

Display information about VLANs by using the `network port vlan show` command. The following command displays information about all VLANs in the cluster:

```
network port vlan show
                 Network Network
Node   VLAN Name Port    VLAN ID  MAC Address
------ --------- ------- -------- -----------------
cluster-1-01
       a0a-10    a0a     10       02:a0:98:06:10:b2
       a0a-20    a0a     20       02:a0:98:06:10:b2
       a0a-30    a0a     30       02:a0:98:06:10:b2
       a0a-40    a0a     40       02:a0:98:06:10:b2
       a0a-50    a0a     50       02:a0:98:06:10:b2
cluster-1-02
       a0a-10    a0a     10       02:a0:98:06:10:ca
       a0a-20    a0a     20       02:a0:98:06:10:ca
       a0a-30    a0a     30       02:a0:98:06:10:ca
       a0a-40    a0a     40       02:a0:98:06:10:ca
       a0a-50    a0a     50       02:a0:98:06:10:ca
```

Display interface group information (cluster administrators only)

You can display information about an interface group to determine its configuration.

About this task

The following information is displayed:

- Node on which the interface group is located
- List of network ports that are included in the interface group
- Interface group's name
- Distribution function (MAC, IP, port, or sequential)
- Interface group's Media Access Control (MAC) address
- Port activity status; that is, whether all aggregated ports are active (full participation), whether some are active (partial participation), or whether none are active

Step

Display information about interface groups by using the `network port ifgrp show` command.

You can display detailed information for each node by specifying the `-instance` parameter. You can display specific information by specifying field names using the `-fields` parameter.

The following command displays information about all interface groups in the cluster:

```
network port ifgrp show
         Port     Distribution                    Active
Node     IfGrp    Function     MAC Address        Ports   Ports
-------- -------- ------------ -----------------  ------- --------
cluster-1-01
         a0a      ip           02:a0:98:06:10:b2  full    e7a, e7b
cluster-1-02
         a0a      sequential   02:a0:98:06:10:ca  full    e7a, e7b
cluster-1-03
         a0a      port         02:a0:98:08:5b:66  full    e7a, e7b
cluster-1-04
         a0a      mac          02:a0:98:08:61:4e  full    e7a, e7b
```

The following command displays detailed interface group information for a single node:

```
network port ifgrp show -instance -node cluster-1-01

                  Node: cluster-1-01
 Interface Group Name: a0a
Distribution Function: ip
        Create Policy: multimode
          MAC Address: 02:a0:98:06:10:b2
   Port Participation: full
        Network Ports: e7a, e7b
             Up Ports: e7a, e7b
           Down Ports: -
```

Display LIF information

You can view detailed information about a LIF to determine its configuration.

You might also want to view this information to diagnose basic LIF problems, such as checking for duplicate IP addresses or verifying whether the network port belongs to the correct subnet. storage virtual machine (SVM) administrators can view only the information about the LIFs associated with the SVM.

About this task

The following information is displayed:

- IP address associated with the LIF
- Administrative status of the LIF
- Operational status of the LIF

  The operational status of data LIFs is determined by the status of the SVM with which the data LIFs are

associated. When the SVM is stopped, the operational status of the LIF changes to down. When the SVM is started again, the operational status changes to up

- Node and the port on which the LIF resides

If data for a field is not available (for example, if there is no extended status information), the field value is listed as `-`.

Step

Display LIF information by using the network interface show command.

You can view detailed information for each LIF by specifying the -instance parameter, or get specific information by specifying field names using the -fields parameter.

The following command displays general information about all LIFs in a cluster:

```
network interface show
           Logical    Status     Network          Current      Current Is
Vserver    Interface  Admin/Oper Address/Mask     Node         Port
Home
---------- ---------- ---------- ---------------- ------------ -------
----
example
           lif1         up/up    192.0.2.129/22   node-01
                                                               e0d
false
node
           cluster_mgmt up/up    192.0.2.3/20     node-02
                                                               e0c
false
node-01
           clus1        up/up    192.0.2.65/18    node-01
                                                               e0a
true
           clus2        up/up    192.0.2.66/18    node-01
                                                               e0b
true
           mgmt1        up/up    192.0.2.1/20     node-01
                                                               e0c
true
node-02
           clus1        up/up    192.0.2.67/18    node-02
                                                               e0a
true
           clus2        up/up    192.0.2.68/18    node-02
                                                               e0b
true
           mgmt2        up/up    192.0.2.2/20     node-02
                                                               e0d
true
vs1
           d1           up/up    192.0.2.130/21   node-01
                                                               e0d
false
           d2           up/up    192.0.2.131/21   node-01
                                                               e0d
true
           data3        up/up    192.0.2.132/20   node-02
                                                               e0c
true
```

The following command shows detailed information about a single LIF:

```
network interface show -lif data1 -instance

                    Vserver Name: vs1
          Logical Interface Name: data1
                            Role: data
                   Data Protocol: nfs,cifs
                       Home Node: node-01
                       Home Port: e0c
                    Current Node: node-03
                    Current Port: e0c
              Operational Status: up
                 Extended Status: -
                         Is Home: false
                 Network Address: 192.0.2.128
                         Netmask: 255.255.192.0
            Bits in the Netmask: 18
                IPv4 Link Local: -
                    Subnet Name: -
           Administrative Status: up
                 Failover Policy: local-only
                 Firewall Policy: data
                     Auto Revert: false
   Fully Qualified DNS Zone Name: xxx.example.com
         DNS Query Listen Enable: false
             Failover Group Name: Default
                        FCP WWPN: -
                  Address family: ipv4
                         Comment: -
                  IPspace of LIF: Default
```

Display routing information

You can display information about routes within an SVM.

Step

Depending on the type of routing information that you want to view, enter the applicable command:

To view information about…	Enter
Static routes, per SVM	`network route show`
LIFs on each route, per SVM	`network route show-lifs`

You can display detailed information for each route by specifying the `-instance` parameter. The following command displays the static routes within the SVMs in cluster- 1:

```
network route show
Vserver             Destination     Gateway         Metric
------------------- --------------- --------------- ------
Cluster
                    0.0.0.0/0       10.63.0.1       10
cluster-1
                    0.0.0.0/0       198.51.9.1      10
vs1
                    0.0.0.0/0       192.0.2.1       20
vs3
                    0.0.0.0/0       192.0.2.1       20
```

The following command displays the association of static routes and logical interfaces (LIFs) within all SVMs in cluster-1:

```
network route show-lifs
Vserver: Cluster
Destination             Gateway                 Logical Interfaces
----------------------  ----------------------  -------------------
0.0.0.0/0               10.63.0.1               -

Vserver: cluster-1
Destination             Gateway                 Logical Interfaces
----------------------  ----------------------  -------------------
0.0.0.0/0               198.51.9.1              cluster_mgmt,
                                                cluster-1_mgmt1,

Vserver: vs1
Destination             Gateway                 Logical Interfaces
----------------------  ----------------------  -------------------
0.0.0.0/0               192.0.2.1               data1_1, data1_2

Vserver: vs3
Destination             Gateway                 Logical Interfaces
----------------------  ----------------------  -------------------
0.0.0.0/0               192.0.2.1               data2_1, data2_2
```

Display DNS host table entries (cluster administrators only)

The DNS host table entries map host names to IP addresses. You can display the host names and alias names and the IP address that they map to for all SVMs in a cluster.

Step

Display the host name entries for all SVMs by using the vserver services name-service dns hosts show

command.

The following example displays the host table entries:

```
vserver services name-service dns hosts show
Vserver    Address         Hostname        Aliases
---------- --------------- --------------- --------------------
cluster-1
           10.72.219.36    lnx219-36       -
vs1
           10.72.219.37    lnx219-37       lnx219-37.example.com
```

You can use the `vserver services name-service dns` command to enable DNS on an SVM, and configure it to use DNS for host-name resolution. Host names are resolved using external DNS servers.

Display DNS domain configurations

You can display the DNS domain configuration of one or more storage virtual machines (SVMs) in your cluster to verify that it is configured properly.

Step

Viewing the DNS domain configurations by using the `vserver services name-service dns show` command.

The following command displays the DNS configurations for all SVMs in the cluster:

```
vserver services name-service dns show
                                                  Name
Vserver         State     Domains                 Servers
--------------- --------- ----------------------- -------------
cluster-1        enabled   xyz.company.com         192.56.0.129,
                                                  192.56.0.130
vs1             enabled   xyz.company.com         192.56.0.129,
                                                  192.56.0.130
vs2             enabled   xyz.company.com         192.56.0.129,
                                                  192.56.0.130
vs3             enabled   xyz.company.com         192.56.0.129,
                                                  192.56.0.130
```

The following command displays detailed DNS configuration information for SVM vs1:

```
vserver services name-service dns show -vserver vs1
               Vserver: vs1
               Domains: xyz.company.com
          Name Servers: 192.56.0.129, 192.56.0.130
    Enable/Disable DNS: enabled
        Timeout (secs): 2
      Maximum Attempts: 1
```

Display information about failover groups

You can view information about failover groups, including the list of nodes and ports in each failover group, whether failover is enabled or disabled, and the type of failover policy that is being applied to each LIF.

Steps

1. Display the target ports for each failover group by using the `network interface failover-groups show` command.

   The following command displays information about all failover groups on a two-node cluster:

   ```
   network interface failover-groups show
                                Failover
   Vserver          Group       Targets
   ---------------- ----------- --------------------------------
   Cluster
                    Cluster
                                cluster1-01:e0a, cluster1-01:e0b,
                                cluster1-02:e0a, cluster1-02:e0b
   vs1
                    Default
                                cluster1-01:e0c, cluster1-01:e0d,
                                cluster1-01:e0e, cluster1-02:e0c,
                                cluster1-02:e0d, cluster1-02:e0e
   ```

2. Display the target ports and broadcast domain for a specific failover group by using the `network interface failover-groups show` command.

   The following command displays detailed information about failover group data12 for SVM vs4:

```
network interface failover-groups show -vserver vs4 -failover-group
data12

       Vserver Name: vs4
Failover Group Name: data12
   Failover Targets: cluster1-01:e0f, cluster1-01:e0g, cluster1-02:e0f,
                     cluster1-02:e0g
   Broadcast Domain: Default
```

3. Display the failover settings used by all LIFs by using the `network interface show` command.

   The following command displays the failover policy and failover group that is being used by each LIF:

```
network interface show -vserver * -lif * -fields failover-
group,failover-policy
vserver   lif                  failover-policy        failover-group
--------  -------------------  ---------------------  --------------
Cluster   cluster1-01_clus_1  local-only             Cluster
Cluster   cluster1-01_clus_2  local-only             Cluster
Cluster   cluster1-02_clus_1  local-only             Cluster
Cluster   cluster1-02_clus_2  local-only             Cluster
cluster1  cluster_mgmt        broadcast-domain-wide  Default
cluster1  cluster1-01_mgmt1   local-only             Default
cluster1  cluster1-02_mgmt1   local-only             Default
vs1       data1               disabled               Default
vs3       data2               system-defined         group2
```

Display LIF failover targets

You might have to check whether the failover policies and the failover groups of a LIF are configured correctly. To prevent misconfiguration of the failover rules, you can display the failover targets for a single LIF or for all LIFs.

About this task

Displaying LIF failover targets enables you to check for the following:

- Whether the LIFs are configured with the correct failover group and failover policy
- Whether the resulting list of failover target ports is appropriate for each LIF
- Whether the failover target of a data LIF is not a management port (e0M)

Step

Display the failover targets of a LIF by using the `failover` option of the `network interface show` command.

The following command displays information about the failover targets for all LIFs in a two-node cluster. The `Failover Targets` row shows the (prioritized) list of node-port combinations for a given LIF.

```
network interface show -failover
         Logical       Home                  Failover        Failover
Vserver  Interface     Node:Port             Policy          Group
-------- ------------ --------------------- --------------- ---------
Cluster
         node1_clus1   node1:e0a             local-only      Cluster
                       Failover Targets: node1:e0a,
                                         node1:e0b
         node1_clus2   node1:e0b             local-only      Cluster
                       Failover Targets: node1:e0b,
                                         node1:e0a
         node2_clus1   node2:e0a             local-only      Cluster
                       Failover Targets: node2:e0a,
                                         node2:e0b
         node2_clus2   node2:e0b             local-only      Cluster
                       Failover Targets: node2:e0b,
                                         node2:e0a
cluster1
         cluster_mgmt  node1:e0c             broadcast-domain-wide
                                                             Default
                       Failover Targets: node1:e0c,
                                         node1:e0d,
                                         node2:e0c,
                                         node2:e0d
         node1_mgmt1   node1:e0c             local-only      Default
                       Failover Targets: node1:e0c,
                                         node1:e0d
         node2_mgmt1   node2:e0c             local-only      Default
                       Failover Targets: node2:e0c,
                                         node2:e0d
vs1
         data1         node1:e0e             system-defined  bcast1
                       Failover Targets: node1:e0e,
                                         node1:e0f,
                                         node2:e0e,
                                         node2:e0f
```

Display LIFs in a load balancing zone

You can verify whether a load balancing zone is configured correctly by displaying all of the LIFs that belong to it. You can also view the load balancing zone of a particular LIF, or the load balancing zones for all LIFs.

Step

Display the LIFs and load balancing details that you want by using one of the following commands

To display…	Enter…
LIFs in a particular load balancing zone	network interface show -dns-zone zone_name zone_name specifies the name of the load balancing zone
The load balancing zone of a particular LIF	network interface show -lif lif_name -fields dns-zone
The load balancing zones of all LIFs	network interface show -fields dns-zone

Examples of displaying load balancing zones for LIFs

The following command displays the details of all LIFs in the load balancing zone storage.company.com for SVM vs0:

```
net int show -vserver vs0 -dns-zone storage.company.com

         Logical    Status     Network            Current   Current Is
Vserver  Interface  Admin/Oper Address/Mask       Node      Port    Home
-------- ---------- ---------- ------------------ --------- ------- ----
vs0
         lif3         up/up    10.98.226.225/20   ndeux-11  e0c     true
         lif4         up/up    10.98.224.23/20    ndeux-21  e0c     true
         lif5         up/up    10.98.239.65/20    ndeux-11  e0c     true
         lif6         up/up    10.98.239.66/20    ndeux-11  e0c     true
         lif7         up/up    10.98.239.63/20    ndeux-21  e0c     true
         lif8         up/up    10.98.239.64/20    ndeux-21  e0c     true
```

The following command displays the DNS zone details of the LIF data3:

```
network interface show -lif data3 -fields dns-zone
Vserver  lif    dns-zone
-------  -----  --------
vs0      data3  storage.company.com
```

The following command displays the list of all LIFs in the cluster and their corresponding DNS zones:

```
network interface show -fields dns-zone
Vserver   lif          dns-zone
-------   ------------ --------
cluster   cluster_mgmt none
ndeux-21  clus1        none
ndeux-21  clus2        none
ndeux-21  mgmt1        none
vs0       data1        storage.company.com
vs0       data2        storage.company.com
```

Display cluster connections

You can display all the active connections in the cluster or a count of active connections on the node by client, logical interface, protocol, or service. You can also display all the listening connections in the cluster.

Display active connections by client (cluster administrators only)

You can view the active connections by client to verify the node that a specific client is using and to view possible imbalances between client counts per node.

About this task

The count of active connections by client is useful in the following scenarios:

- Finding a busy or overloaded node.
- Determining why a particular client's access to a volume is slow.

  You can view details about the node that the client is accessing and then compare it with the node on which the volume resides. If accessing the volume requires traversing the cluster network, clients might experience decreased performance because of the remote access to the volume on an oversubscribed remote node.

- Verifying that all nodes are being used equally for data access.
- Finding clients that have an unexpectedly high number of connections.
- Verifying whether certain clients have connections to a node.

Step

Display a count of the active connections by client on a node by using the `network connections active show-clients` command.

For more information about this command, see the man page: ONTAP 9 commands

```
network connections active show-clients
Node    Vserver Name    Client IP Address     Count
------  --------------  -----------------     ------
node0   vs0             192.0.2.253                1
        vs0             192.0.2.252                2
        Cluster         192.10.2.124               5
node1   vs0             192.0.2.250                1
        vs0             192.0.2.252                3
        Cluster         192.10.2.123               4
node2   vs1             customer.example.com       1
        vs1             192.0.2.245                3
        Cluster         192.10.2.122               4
node3   vs1             customer.example.org       1
        vs1             customer.example.net       3
        Cluster         192.10.2.121               4
```

Display active connections by protocol (cluster administrators only)

You can display a count of the active connections by protocol (TCP or UDP) on a node to compare the usage of protocols within the cluster.

About this task

The count of active connections by protocol is useful in the following scenarios:

- Finding the UDP clients that are losing their connection.

  If a node is near its connection limit, UDP clients are the first to be dropped.

- Verifying that no other protocols are being used.

Step

Display a count of the active connections by protocol on a node by using the `network connections active show-protocols` command.

For more information about this command, see the man page.

```
network connections active show-protocols
Node     Vserver Name  Protocol   Count
-------  ------------  ---------  ------
node0
         vs0           UDP            19
         Cluster       TCP            11
node1
         vs0           UDP            17
         Cluster       TCP             8
node2
         vs1           UDP            14
         Cluster       TCP            10
node3
         vs1           UDP            18
         Cluster       TCP             4
```

Display active connections by service (cluster administrators only)

You can display a count of the active connections by service type (for example, by NFS, SMB, mount, and so on) for each node in a cluster. This is useful to compare the usage of services within the cluster, which helps to determine the primary workload of a node.

About this task

The count of active connections by service is useful in the following scenarios:

- Verifying that all nodes are being used for the appropriate services and that the load balancing for that service is working.
- Verifying that no other services are being used. Display a count of the active connections by service on a node by using the `network connections active show-services` command.

For more information about this command, see the man page: ONTAP 9 commands

```
network connections active show-services
Node        Vserver Name    Service    Count
---------   -------------   ---------  ------
node0
            vs0             mount            3
            vs0             nfs             14
            vs0             nlm_v4           4
            vs0             cifs_srv         3
            vs0             port_map        18
            vs0             rclopcp         27
            Cluster         ctlopcp         60
node1
            vs0             cifs_srv         3
            vs0             rclopcp         16
            Cluster         ctlopcp         60
node2
            vs1             rclopcp         13
            Cluster         ctlopcp         60
node3
            vs1             cifs_srv         1
            vs1             rclopcp         17
            Cluster         ctlopcp         60
```

Display active connections by LIF on a node and SVM

You can display a count of active connections for each LIF, by node and storage virtual machine (SVM), to view connection imbalances between LIFs within the cluster.

About this task

The count of active connections by LIF is useful in the following scenarios:

- Finding an overloaded LIF by comparing the number of connections on each LIF.
- Verifying that DNS load balancing is working for all data LIFs.
- Comparing the number of connections to the various SVMs to find the SVMs that are used the most.

Step

Display a count of active connections for each LIF by SVM and node by using the `network connections active show-lifs` command.

For more information about this command, see the man page: ONTAP 9 commands

```
network connections active show-lifs
Node      Vserver Name  Interface Name  Count
--------  ------------  --------------- ------
node0
          vs0           datalif1             3
          Cluster       node0_clus_1         6
          Cluster       node0_clus_2         5
node1
          vs0           datalif2             3
          Cluster       node1_clus_1         3
          Cluster       node1_clus_2         5
node2
          vs1           datalif2             1
          Cluster       node2_clus_1         5
          Cluster       node2_clus_2         3
node3
          vs1           datalif1             1
          Cluster       node3_clus_1         2
          Cluster       node3_clus_2         2
```

Display active connections in a cluster

You can display information about the active connections in a cluster to view the LIF, port, remote host, service, storage virtual machines (SVMs), and protocol used by individual connections.

About this task

Viewing the active connections in a cluster is useful in the following scenarios:

- Verifying that individual clients are using the correct protocol and service on the correct node.
- If a client is having trouble accessing data using a certain combination of node, protocol, and service, you can use this command to find a similar client for configuration or packet trace comparison.

Step

Display the active connections in a cluster by using the `network connections active show` command.

For more information about this command, see the man page: ONTAP 9 commands

The following command shows the active connections on the node node1:

```
network connections active show -node node1
Vserver  Interface           Remote
Name     Name:Local Port     Host:Port           Protocol/Service
-------  ------------------  ------------------  ---------------
Node: node1
Cluster  node1_clus_1:50297  192.0.2.253:7700    TCP/ctlopcp
Cluster  node1_clus_1:13387  192.0.2.253:7700    TCP/ctlopcp
Cluster  node1_clus_1:8340   192.0.2.252:7700    TCP/ctlopcp
Cluster  node1_clus_1:42766  192.0.2.252:7700    TCP/ctlopcp
Cluster  node1_clus_1:36119  192.0.2.250:7700    TCP/ctlopcp
vs1      data1:111           host1.aa.com:10741  UDP/port-map
vs3      data2:111           host1.aa.com:10741  UDP/port-map
vs1      data1:111           host1.aa.com:12017  UDP/port-map
vs3      data2:111           host1.aa.com:12017  UDP/port-map
```

The following command shows the active connections on SVM vs1:

```
network connections active show -vserver vs1
Vserver  Interface           Remote
Name     Name:Local Port     Host:Port           Protocol/Service
-------  ------------------  ------------------  ---------------
Node: node1
vs1      data1:111           host1.aa.com:10741  UDP/port-map
vs1      data1:111           host1.aa.com:12017  UDP/port-map
```

Display listening connections in a cluster

You can display information about the listening connections in a cluster to view the LIFs and ports that are accepting connections for a given protocol and service.

About this task

Viewing the listening connections in a cluster is useful in the following scenarios:

- Verifying that the desired protocol or service is listening on a LIF if client connections to that LIF fail consistently.
- Verifying that a UDP/rclopcp listener is opened at each cluster LIF if remote data access to a volume on one node through a LIF on another node fails.
- Verifying that a UDP/rclopcp listener is opened at each cluster LIF if SnapMirror transfers between two nodes in the same cluster fail.
- Verifying that a TCP/ctlopcp listener is opened at each intercluster LIF if SnapMirror transfers between two nodes in different clusters fail.

Step

Display the listening connections per node by using the `network connections listening show` command.

```
network connections listening show
Vserver Name     Interface Name:Local Port        Protocol/Service
---------------- -------------------------------  ----------------
Node: node0
Cluster          node0_clus_1:7700                TCP/ctlopcp
vs1              data1:4049                       UDP/unknown
vs1              data1:111                        TCP/port-map
vs1              data1:111                        UDP/port-map
vs1              data1:4046                       TCP/sm
vs1              data1:4046                       UDP/sm
vs1              data1:4045                       TCP/nlm-v4
vs1              data1:4045                       UDP/nlm-v4
vs1              data1:2049                       TCP/nfs
vs1              data1:2049                       UDP/nfs
vs1              data1:635                        TCP/mount
vs1              data1:635                        UDP/mount
Cluster          node0_clus_2:7700                TCP/ctlopcp
```

Commands for diagnosing network problems

You can diagnose problems on your network by using commands such as `ping`, `traceroute`, `ndp`, and `tcpdump`. You can also use commands such as `ping6` and `traceroute6` to diagnose IPv6 problems.

If you want to…	Enter this command…
Test whether the node can reach other hosts on your network	network ping
Test whether the node can reach other hosts on your IPv6 network	network ping6
Trace the route that the IPv4 packets take to a network node	network traceroute
Trace the route that the IPv6 packets take to a network node	network traceroute6
Manage the Neighbor Discovery Protocol (NDP)	network ndp
Display statistics about packets that are received and sent on a specified network interface or on all network interfaces	run -node node_name ifstat **Note**: This command is available from the nodeshell.
Display information about neighboring devices that are discovered from each node and port in the cluster, including the remote device type and device platform	network device-discovery show
View the CDP neighbors of the node (ONTAP supports only CDPv1 advertisements)	run -node node_name cdpd show-neighbors **Note**: This command is available from the nodeshell.

If you want to…	Enter this command…
Trace the packets that are sent and received in the network	network tcpdump start -node node-name - port port_name **Note**: This command is available from the nodeshell.
Measure latency and throughput between intercluster or intracluster nodes	network test-path -source-node source_nodename
local -destination- cluster destination_clustername - destination-node destination_nodename - session-type Default	AsyncMirrorLocal
AsyncMirrorRemote	SyncMirrorRemote

For more information about these commands, see the appropriate man pages: ONTAP 9 commands

Display network connectivity with neighbor discovery protocols

In a data center, you can use neighbor discovery protocols to view network connectivity between a pair of physical or virtual systems and their network interfaces. ONTAP supports two neighbor discovery protocols: Cisco Discovery Protocol (CDP) and Link Layer Discovery Protocol (LLDP).

About this task

Neighbor discovery protocols enable you to automatically discover and view information about directly connected protocol-enabled devices in a network. Each device advertises identification, capabilities, and connectivity information. This information is transmitted in Ethernet frames to a multicast MAC address and is received by all neighboring protocol-enabled devices.

For two devices to become neighbors, each must have a protocol enabled and correctly configured. Discovery protocol functionality is limited to directly connected networks. Neighbors can include protocol-enabled devices such as switches, routers, bridges, and so on. ONTAP supports two neighbor discovery protocols, which can be used individually or together.

Cisco Discovery Protocol (CDP)

CDP is a proprietary link layer protocol developed by Cisco Systems. It is enabled by default in ONTAP for cluster ports, but must be enabled explicitly for data ports.

Link Layer Discovery Protocol (LLDP)

LLDP is a vendor-neutral protocol specified in the standards document IEEE 802.1AB. It must be enabled explicitly for all ports.

Use CDP to detect network connectivity

Using CDP to detect network connectivity consists of reviewing deployment considerations, enabling it on data ports, viewing neighbor devices, and adjusting CDP configuration values as needed. CDP is enabled by default on cluster ports.

CDP must also be enabled on any switches and routers before information about neighbor devices can be

displayed.

CDP is also used by the cluster switch health monitor to automatically discover your cluster and management network switches.

Related information

System administration

Considerations for using CDP

By default, CDP-compliant devices send CDPv2 advertisements. CDP-compliant devices send CDPv1 advertisements only when they receive CDPv1 advertisements. ONTAP supports only CDPv1. Therefore, when an ONTAP node sends CDPv1 advertisements, CDP-compliant neighboring devices send back CDPv1 advertisements.

You should consider the following information before enabling CDP on a node:

- CDP is always enabled on cluster ports.
- CDP is disabled, by default, on all non-cluster ports.
- CDP is supported for all ports.
- CDP advertisements are sent and received by ports that are in the up state.
- CDP must be enabled on both the transmitting and receiving devices for sending and receiving CDP advertisements.
- CDP advertisements are sent at regular intervals, and you can configure the time interval.
- When IP addresses are changed for a LIF, the node sends the updated information in the next CDP advertisement.

> Sometimes when LIFs are changed on the node, the CDP information is not updated at the receiving device side (for example, a switch). If you encounter such a problem, you should configure the network interface of the node to the down status and then to the up status.

- Only IPv4 addresses are advertised in CDP advertisements.
- For physical network ports with VLANs, all of the LIFs configured on the VLANs on that port are advertised.
- For physical ports that are part of an interface group, all of the IP addresses configured on that interface group are advertised on each physical port.
- For an interface group that hosts VLANs, all of the LIFs configured on the interface group and the VLANs are advertised on each of the network ports.
- For packets with MTU size equal to or greater than 1,500 bytes, only the number of LIFs that can fit into a 1500 MTU-sized packet is advertised.

Enable or disable CDP

To discover and send advertisements to CDP-compliant neighboring devices, CDP must be enabled on each node of the cluster. By default, CDP is enabled on all cluster ports of a node and disabled on all non-cluster ports of a node.

About this task

The `cdpd.enable` option controls whether CDP is enabled or disabled on the ports of a node:

- on enables CDP on non-cluster ports.
- off disables CDP on non-cluster ports; you cannot disable CDP on cluster ports.

When CDP is disabled on a port that is connected to a CDP-compliant device, network traffic might not be optimized.

Steps

1. Display the current CDP setting for a node, or for all nodes in a cluster:

To view the CDP setting of…	Enter
A node	run - node <node_name> options cdpd.enabled
All nodes in a cluster	options cdpd.enabled

2. Enable or disable CDP on all ports of a node, or on all ports of all nodes in a cluster:

To enable or disable CDP on…	Enter…
A node	run -node node_name options cdpd.enable {on or off}
All nodes in a cluster	options cdpd.enable {on or off}

View CDP neighbor information

You can view information about the neighboring devices that are connected to each port of the nodes of your cluster, provided that the port is connected to a CDP-compliant device. You can use the `network device-discovery show -protocol cdp` command to view neighbor information.

About this task

Because CDP is always enabled for cluster ports, CDP neighbor information is always displayed for those ports. CDP must be enabled on non-cluster ports for neighbor information to appear for those ports.

Step

Display information about all CDP-compliant devices that are connected to the ports on a node in the cluster:

```
network device-discovery show -node node -protocol cdp
```

The following command shows the neighbors that are connected to the ports on node cluster-1_01:

```
network device-discovery show -node sti2650-212 -protocol cdp
Node/       Local  Discovered
Protocol    Port   Device (LLDP: ChassisID)  Interface         Platform
----------- ------ ------------------------- ----------------
----------------
sti2650-212/cdp
            e0M    RTP-LF810-510K37.gdl.eng.netapp.com(SAL1942R8JS)
                                             Ethernet1/14      N9K-
C93120TX
            e0a    CS:RTP-CS01-510K35        0/8               CN1610
            e0b    CS:RTP-CS01-510K36        0/8               CN1610
            e0c    RTP-LF350-510K34.gdl.eng.netapp.com(FDO21521S76)
                                             Ethernet1/21      N9K-
C93180YC-FX
            e0d    RTP-LF349-510K33.gdl.eng.netapp.com(FDO21521S4T)
                                             Ethernet1/22      N9K-
C93180YC-FX
            e0e    RTP-LF349-510K33.gdl.eng.netapp.com(FDO21521S4T)
                                             Ethernet1/23      N9K-
C93180YC-FX
            e0f    RTP-LF349-510K33.gdl.eng.netapp.com(FDO21521S4T)
                                             Ethernet1/24      N9K-
C93180YC-FX
```

The output lists the Cisco devices that are connected to each port of the specified node.

Configure the hold time for CDP messages

Hold time is the period of time for which CDP advertisements are stored in cache in neighboring CDP-compliant devices. Hold time is advertised in each CDPv1 packet and is updated whenever a CDPv1 packet is received by a node.

- The value of the `cdpd.holdtime` option should be set to the same value on both nodes of an HA pair.
- The default hold time value is 180 seconds, but you can enter values ranging from 10 seconds to 255 seconds.
- If an IP address is removed before the hold time expires, the CDP information is cached until the hold time expires.

Steps

1. Display the current CDP hold time for a node, or for all nodes in a cluster:

To view the hold time of…	Enter…
A node	`run -node node_name options cdpd.holdtime`
All nodes in a cluster	`options cdpd.holdtime`

2. Configure the CDP hold time on all ports of a node, or on all ports of all nodes in a cluster:

To set the hold time on…	Enter…
A node	`run -node node_name options cdpd.holdtime holdtime`
All nodes in a cluster	op`tions cdpd.holdtime holdtime`

Set the interval for sending CDP advertisements

CDP advertisements are sent to CDP neighbors at periodic intervals. You can increase or decrease the interval for sending CDP advertisements depending on network traffic and changes in the network topology.

- The value of the `cdpd.interval` option should be set to the same value on both nodes of an HA pair.
- The default interval is 60 seconds, but you can enter a value from 5 seconds to 900 seconds.

Steps

1. Display the current CDP advertisement time interval for a node, or for all nodes in a cluster:

To view the interval for…	Enter…
A node	`run -node node_name options cdpd.interval`
All nodes in a cluster	`options cdpd.interval`

2. Configure the interval for sending CDP advertisements for all ports of a node, or for all ports of all nodes in a cluster:

To set the interval for…	Enter…
A node	`run -node node_name options cdpd.interval interval`
All nodes in a cluster	`options cdpd.interval interval`

View or clear CDP statistics

You can view the CDP statistics for the cluster and non-cluster ports on each node to detect potential network connectivity issues. CDP statistics are cumulative from the time they were last cleared.

About this task

Because CDP is always enabled for cluster ports, CDP statistics are always displayed for traffic on those ports. CDP must be enabled on non-cluster ports for statistics to appear for those ports.

Step

Display or clear the current CDP statistics for all ports on a node:

If you want to…	Enter…
View the CDP statistics	`run -node node_name cdpd show-stats`

If you want to…	Enter…
Clear the CDP statistics	`run -node node_name cdpd zero-stats`

Example of showing and clearing statistics

The following command shows the CDP statistics before they are cleared. The output displays the total number of packets that have been sent and received since the last time the statistics were cleared.

```
run -node node1 cdpd show-stats

RECEIVE
 Packets:          9116  | Csum Errors:        0  | Unsupported Vers:  4561
 Invalid length:      0  | Malformed:          0  | Mem alloc fails:      0
 Missing TLVs:        0  | Cache overflow:     0  | Other errors:         0

TRANSMIT
 Packets:          4557  | Xmit fails:         0  | No hostname:          0
 Packet truncated:    0  | Mem alloc fails:    0  | Other errors:         0

OTHER
 Init failures:       0
```

The following command clears the CDP statistics:

```
run -node node1 cdpd zero-stats
```

```
run -node node1 cdpd show-stats

RECEIVE
 Packets:             0  | Csum Errors:        0  | Unsupported Vers:     0
 Invalid length:      0  | Malformed:          0  | Mem alloc fails:      0
 Missing TLVs:        0  | Cache overflow:     0  | Other errors:         0

TRANSMIT
 Packets:             0  | Xmit fails:         0  | No hostname:          0
 Packet truncated:    0  | Mem alloc fails:    0  | Other errors:         0

OTHER
 Init failures:       0
```

After the statistics are cleared, they begin to accumulate after the next CDP advertisement is sent or received.

Use LLDP to detect network connectivity

Using LLDP to detect network connectivity consists of reviewing deployment considerations, enabling it on all ports, viewing neighbor devices, and adjusting LLDP configuration values as needed.

LLDP must also be enabled on any switches and routers before information about neighbor devices can be displayed.

ONTAP currently reports the following type-length-value structures (TLVs):

- Chassis ID
- Port ID
- Time-To-Live (TTL)
- System name

  The system name TLV is not sent on CNA devices.

Certain converged network adapters (CNAs), such as the X1143 adapter and the UTA2 onboard ports, contain offload support for LLDP:

- LLDP offload is used for Data Center Bridging (DCB).
- Displayed information might differ between the cluster and the switch.

  For example, the Chassis ID and Port ID data displayed by the switch might be different for CNA and non-CNA ports, but the data displayed by the cluster is consistent for these port types.

The LLDP specification defines access to the collected information through an SNMP MIB. However, ONTAP does not currently support the LLDP MIB.

Enable or disable LLDP

To discover and send advertisements to LLDP-compliant neighboring devices, LLDP must be enabled on each node of the cluster. Starting with ONTAP 9.7, LLDP is enabled on all ports of a node by default.

About this task

The `lldp.enable` option controls whether LLDP is enabled or disabled on the ports of a node:

- `on` enables LLDP on all ports.
- `off` disables LLDP on all ports.

Steps

1. Display the current LLDP setting for a node, or for all nodes in a cluster:
   - Single node: `run -node node_name options lldp.enable`
   - All nodes: options `lldp.enable`
2. Enable or disable LLDP on all ports of a node, or on all ports of all nodes in a cluster:

To enable or disable LLDP on…	Enter…
A node	`run -node node_name options lldp.enable {on|off}`
All nodes in a cluster	`options lldp.enable {on|off}`

- Single node:

```
run -node node_name options lldp.enable {on|off}
```

- All nodes:

```
options lldp.enable {on|off}
```

View LLDP neighbor information

You can view information about the neighboring devices that are connected to each port of the nodes of your cluster, provided that the port is connected to an LLDP-compliant device. You use the network device-discovery show command to view neighbor information.

Step

Display information about all LLDP-compliant devices that are connected to the ports on a node in the cluster:

```
network device-discovery show -node node -protocol lldp
```

The following command shows the neighbors that are connected to the ports on node cluster-1_01. The output lists the LLDP-enabled devices that are connected to each port of the specified node. If the `-protocol` option is omitted, the output also lists CDP-enabled devices.

```
network device-discovery show -node cluster-1_01 -protocol lldp
Node/       Local  Discovered
Protocol    Port   Device                    Interface         Platform
----------- ------ ------------------------- ----------------
----------------
cluster-1_01/lldp
            e2a    0013.c31e.5c60            GigabitEthernet1/36
            e2b    0013.c31e.5c60            GigabitEthernet1/35
            e2c    0013.c31e.5c60            GigabitEthernet1/34
            e2d    0013.c31e.5c60            GigabitEthernet1/33
```

Adjust the interval for transmitting LLDP advertisements

LLDP advertisements are sent to LLDP neighbors at periodic intervals. You can increase or decrease the interval for sending LLDP advertisements depending on network traffic and changes in the network topology.

About this task

The default interval recommended by IEEE is 30 seconds, but you can enter a value from 5 seconds to 300 seconds.

Steps

1. Display the current LLDP advertisement time interval for a node, or for all nodes in a cluster:
   - Single node:

     ```
     run -node <node_name> options lldp.xmit.interval
     ```

   - All nodes:

     ```
     options lldp.xmit.interval
     ```

2. Adjust the interval for sending LLDP advertisements for all ports of a node, or for all ports of all nodes in a cluster:
   - Single node:

     ```
     run -node <node_name> options lldp.xmit.interval <interval>
     ```

   - All nodes:

     ```
     options lldp.xmit.interval <interval>
     ```

Adjust the time-to-live value for LLDP advertisements

Time-To-Live (TTL) is the period of time for which LLDP advertisements are stored in cache in neighboring LLDP-compliant devices. TTL is advertised in each LLDP packet and is updated whenever an LLDP packet is received by a node. TTL can be modified in outgoing LLDP frames.

About this task

- TTL is a calculated value, the product of the transmit interval (`lldp.xmit.interval`) and the hold multiplier (`lldp.xmit.hold`) plus one.
- The default hold multiplier value is 4, but you can enter values ranging from 1 to 100.
- The default TTL is therefore 121 seconds, as recommended by IEEE, but by adjusting the transmit interval and hold multiplier values, you can specify a value for outgoing frames from 6 seconds to 30001 seconds.
- If an IP address is removed before the TTL expires, the LLDP information is cached until the TTL expires.

Steps

1. Display the current hold multiplier value for a node, or for all nodes in a cluster:
   - Single node:

     ```
     run -node <node_name> options lldp.xmit.hold
     ```

   - All nodes:

     ```
     options lldp.xmit.hold
     ```

2. Adjust the hold multiplier value on all ports of a node, or on all ports of all nodes in a cluster:
   - Single node:

     ```
     run -node <node_name> options lldp.xmit.hold <hold_value>
     ```

   - All nodes:

     ```
     options lldp.xmit.hold <hold_value>
     ```