

# Packet Forwarding with RPCAP

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The ExtraHop Discover appliance generates metrics about your network and applications through a wire data feed, which is typically mirrored from a switch. However, you might not always have access to a switch or you might want to monitor a specific device that is outside of your wire data network. Additionally, in a cloud environment, such as Microsoft Azure or Amazon Web Services (AWS), you cannot directly access switch hardware. For these types of environments, you can forward packets to a Discover appliance through a software tap such as Remote Packet Capture (RPCAP).

## Before you begin

- You must have experience with ExtraHop appliances, network concepts, and installing utilities on servers to complete the procedures in this guide.
- **WARNING:** Be aware of the data charges that are incurred with AWS. For example, multiple VPC peers within a region can incur additional costs. For information about pricing, see the [AWS Data Transfer](#) page.

This guide provides concepts about the ExtraHop RPCAP implementation along with instructions for all required procedures. Here are some best practices to consider before you deploy RPCAP:

- For best results, begin with a deployment of a few RPCAP senders and evaluate the impact to your environment. As you add senders to the deployment, monitor the CPU usage on your RPCAP-monitored systems, as CPU and memory overhead is correlated to the number of senders that are sending packets to the same Discover appliance.
- Limit the number of RPCAP senders that are sending packets to an appliance. Specifically, we recommend that you configure fewer than 400 RPCAP senders per Discover appliance. If RPCAP is sending packets to both a Discover and Trace appliance, we recommend that you configure 200 senders or fewer. These recommendations are based on our internal lab results. Your experience might vary based on the complexity of your configuration or environment.
- If your ExtraHop system includes the Trace appliance, you can [configure a second feed of packets from your remote environment to the Trace appliance](#).

## Deployment overview

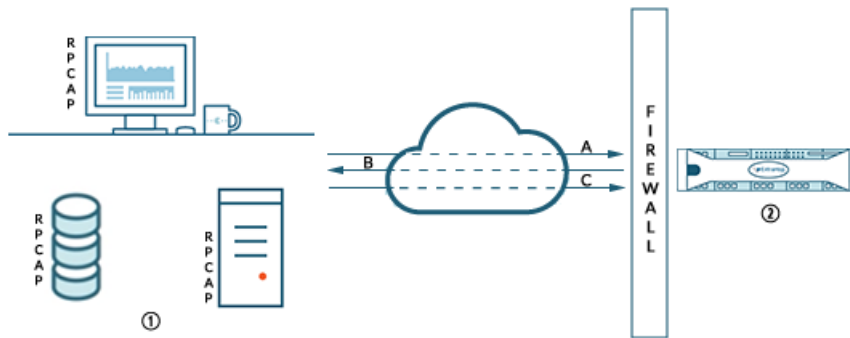
The following steps outline the key procedures that are required to implement RPCAP with an ExtraHop Discover appliance.

1. First, [configure the Discover appliance to accept RPCAP traffic](#) and [add packet-forwarding rules](#).
2. Next, [download the rpcapd software](#) for your operating system from the Discover appliance.
3. If your environment has a firewall, [open ports on your firewall](#) for the requisite RPCAP traffic.
4. Finally, install the rpcapd software on every [Linux](#) and [Windows](#) device that you want to forward traffic from. You must modify the configuration file (rpcapd.ini) to specify device interfaces or to direct traffic to the Discover appliances.
5. If you have a Trace appliance, you must [configure it to accept RPCAP traffic](#), add packet-forwarding rules, and update your rpcapd.ini files to direct traffic to both Discover and Trace appliances.

## Implementing RPCAP with the ExtraHop system

RPCAP is implemented through a small binary file that runs as a daemon (rpcapd) on each device that you want to monitor traffic for. The RPCAP installation package for Windows or Linux can be downloaded directly from your Discover appliance.

The following figure shows a simple RPCAP implementation with a single Discover appliance behind a firewall. Your network configuration might vary.



- ① Devices with rpcapd installed and configured with the Discover appliance information.
- ② Discover appliance with RPCAP enabled and packet-forwarding rules configured.
- A Devices initiate connection over a TCP port.
- B Discover appliances send packet-forwarding rules to devices.
- C Packets are forwarded over a UDP port range.

The ExtraHop implementation of RPCAP operates in active mode, which means that devices installed with rpcapd software initiate a TCP connection to the ExtraHop appliance over defined ports. After the TCP connection is established, the ExtraHop appliance responds with packet-forwarding rules that identify the allowed traffic. When the allowed traffic is detected on the monitored rpcapd device, packets are forwarded to the ExtraHop appliance over a designated UDP port range.

Each rpcap-installed device contains a configuration file (`rpcapd.ini`) with the IP addresses of the ExtraHop appliances where traffic should be sent, and the TCP port over which the connection should be initiated.

Each ExtraHop appliance must have an interface configured to monitor RPCAP traffic. In addition, your ExtraHop appliance must be configured with packet-forwarding rules that determine which packets are forwarded by the remote devices.

## Configure RPCAP on the ExtraHop appliance

You can configure RPCAP and management on the same interface, but you might want to configure a second interface only for RPCAP to avoid unnecessary performance degradation.


1. Log into the Admin UI of the ExtraHop appliance that you want to forward packets to.
2. In the Network Settings section, click **Connectivity**.
3. Select interface 1, 2, 3, or 4.  
The EDA 1000v and ETA 1150v only have interfaces 1 and 2.
4. From the Interface Mode drop-down list, select **Management Port + RPCAP/ERSPAN/VXLAN Target**.
5. DHCPv4 is enabled by default. If your remote devices do not support DHCP, you can disable DHCP and configure a static IP address. Or, you can click on IPv6 to configure your IP address through DHCP or through a static IP address or range on an IPv6 network. Make sure the management interfaces are not configured with overlapping subnets.
6. Click **Save**.

## Configure packet-forwarding rules on the ExtraHop appliance

After you configure the interface as an RPCAP target, you must configure packet-forwarding rules. Packet forwarding rules limit what traffic is allowed to be sent to the ExtraHop appliance through RPCAP.

By default, an entry is configured for port 2003 that accepts traffic from all interface addresses. You can modify the default entry for your environment, delete the default entry, and add additional entries. It is a good practice to set these rules first, so that when you configure rpcapd on your remote devices, the ExtraHop appliance is ready to receive the forwarded packets.

You can configure up to 16 rules for packet forwarding in the ExtraHop appliance; each rule must have a single TCP port over which the ExtraHop appliance communicates the packet-forwarding rules to rpcapd devices.

 **Important:** The information in the rpcapd configuration file on the devices that are forwarding packets must not contradict the rules set in the ExtraHop appliance.

1. In the Network Settings section, click **Connectivity**.
2. In the RPCAP Settings section, complete one of the following actions:
  - Click on **2003** to open the default entry.
  - Click **Add** to add a new entry.
3. In the Add RPCAP Port Definition section, complete the following information:
  - a) In the Port field, type the TCP port that will communicate information about this packet forwarding rule. Port entries must be unique for each interface subnet on the same server.
  - b) In the Interface Address field, type the IP address or CIDR range of the interface on the device that you want the ExtraHop appliance to receive traffic from. For example, 10.10.0.0/24 will forward all traffic on the system that is part of that CIDR range, \* is a wildcard that will match all traffic on the system, or 10.10.0.5 will only send traffic on the interface that matches the 10.10.0.5 IP address.
  - c) In the Interface Name field, type the name of the interface on the device that will send traffic to the ExtraHop appliance. For example, eth0 in a Linux environment or \Device\NPF\_{2C2FC212-701D-42E6-9EAE-BEE969FEFB3F} in a Windows environment.
  - d) In the Filter field, type the ports for the traffic that you want to forward to the ExtraHop appliance in Berkeley Packet Filter (BPF) syntax. For example, you can type `tcp port 80` to forward all traffic on TCP port 80 from your remote network device to the ExtraHop appliance. For more information about BPF syntax, see [Filter packets with Berkeley Packet Filter syntax](#).
4. Click **Save**, which saves the settings and restarts the capture.
5. Repeat these steps to configure additional rules. You can add up to 16 rules.


## Save the running configuration file

After you configure the interface and configure packet forwarding rules, you must save the changes to the running configuration file.

1. In the Network Settings section, click **Connectivity**.
2. Click **View and Save Changes**.
3. Review the changes in the Current running config (not yet saved) pane.
4. Click **Save**.
5. Click **Done**.

## Installing rpcapd on your remote devices

You can access preformatted, up-to-date download and installation commands through `https://<extrahop_management_ip>/tools`, where `<extrahop_management_ip>` is the IP address of your Discover appliance. Information is provided for Linux distributions and Windows.

 **Important:** These options should not be modified without an understanding of how the change might affect your workflow.

When you run the installation command, `rpcapd` automatically starts and initiates communication to the IP address and destination port specified in the command. For example, on a Linux device, where 172.18.10.25 is the IP address of the Discover appliance and the TCP port is 2003, the installation command is `sudo ./install.sh -k 172.18.10.25 2003`.

Running the install command creates a configuration file (`rpcapd.ini`) with an `ActiveClient` entry that defines the IP address and destination port of the Discover appliance, such as `ActiveClient = 10.0.0.100,2003`. The configuration file can be modified to change the Discover appliance information or to further filter the traffic that is sent to the Discover appliance.

### Standard Script

The standard start up script (`/etc/init.d/rpcap`) calls `rpcapd` with the following options:

- v**  
Runs `rpcap` in active mode only instead of both active and passive modes.
- d**  
Runs `rpcap` as a daemon (in Linux) or as a service (in Windows).
- L**  
Sends log messages to a syslog server.
- i <interface>**  
Specify an interface for the RPCAP traffic.
- i <interface> any-eth**  
Captures any Ethernet interface and preserves the required Ethernet framing. (Linux only).

### Script Filters

Modify the start up script to refine the traffic that is sent to the Discover appliance.

- F**  
Specify a local filter in BPF syntax that is combined with any RPCAP filters set on your Discover appliance through the AND operator. While standard BPF standard expressions are supported, RPCAP additionally supports the following qualifiers
- ifn <name>**  
Filter by the interface name. For example, `not ifn eth0` will capture any packets on `eth0`.
- ifidx <num>**  
Filter by the interface index. (Linux only)
- hatype <num>**  
Filter by the hardware type. For example, set this value to 1 for Ethernet or to 772 for loopback. For a complete list of hardware types, see the `ARPHRD_*` constants in the Linux `if_arp.h` header file.

## Install and start `rpcapd` on a Linux device

### Before you begin

The minimum Linux kernel version required to run `rpcapd` is 2.6.32.

1. In a web browser, navigate to `https://<extrahop_management_ip>/tools`, where the `<extrahop_management_ip>` is the IP address of your Discover appliance.
2. Follow the installation instructions to download the package for the Linux distribution of your device. (Optionally, you can view instructions for Generic/Other Linux and then copy and paste the commands to download and install `rpcapd`.)

- Copy and paste the commands to install and start rpcapd. The command will be similar to the following example: `sudo ./install.sh -k 172.18.10.25 2003`, where 172.18.10.25 is the IP address of your ExtraHop appliance and 2003 is the TCP port you want to communicate through.

All traffic that matches the packet forwarding rules is sent to the configured IP address for the Discover appliance.

## Configure rpcapd on a Linux device with multiple interfaces

For devices with multiple interfaces, rpcapd can be configured to forward packets by interface.

To edit the configuration file, complete the following steps.

- After installing rpcapd, open the rpcapd configuration file (`/opt/extrahop/etc/rpcapd.ini`) in a text editor. The configuration file contains text similar to the following example:

```
ActiveClient = 10.0.0.100,2003
NullAuthPermit = YES
```

- Specify an interface to monitor by appending one of the following clauses to the ActiveClient line: `ifaddr=<interface_ip_addr>` or `ifname =<interface_name>`.
- Send traffic to multiple Discover appliances or from multiple interfaces on your device by adding another ActiveClient entry:

```
ActiveClient = <extrahop_management_ip>, <extrahop_rpcapd_port>,
ifname=<interface_name>
```

or

```
ActiveClient = <extrahop_management_ip>, <extrahop_rpcapd_port>,
ifaddr=<interface_ip_address>
```

where `<interface_name>` is the name of the interface from which you want to forward packets and `<interface_ip_address>` is the IP address of the interface from which the packets are forwarded. The `<interface_ip_address>` can be either an individual IP address, such as 10.10.1.100, or a CIDR specification that contains the IP address, such as 10.10.1.0/24

- Save the configuration file.
- Restart rpcapd by running the following command: `sudo /etc/init.d/rpcapd restart`.

## Example Linux configurations

The following example shows an interface in CIDR format.

```
ActiveClient = 10.10.6.45, 2003, ifaddr=10.10.1.0/24
NullAuthPermit = YES
```

The following example shows a configuration that forwards packets by interface name:

```
ActiveClient = 10.10.6.45, 2003, ifname=eth0
NullAuthPermit = YES
```

## Install rpcapd on a Windows device with Powershell



**Note:** Windows RPCAP support requires 64-bit versions for Windows 7, Windows 8.1, Windows 10, Windows Server 2008 R2, Windows Server 2012 R2, and Windows Server 2016.

- In a web browser, navigate to `https://<extrahop_management_ip>/tools`, where the `<extrahop_management_ip>` is the IP address of your Discover appliance..

2. Download and unzip the rpcapd file for Windows.
3. Open PowerShell and navigate to the directory with the unzipped files.
4. Run the following command, where `<extrahop_rpcap_target_ip>` is the IP address of the ExtraHop appliance where you want to forward packets to and `<extrahop_rpcapd_port>` is the port you the device should connect through: the following command: `./install-rpcapd.ps1 -InputDir . -RpcapIp <extrahop_rpcap_target_ip> -RpcapPort <extrahop_rpcapd_port>`

## Configure rpcapd on a Windows device with multiple interfaces

For network devices with multiple interfaces, rpcapd can be configured to forward packets from multiple interfaces.

To edit the configuration file, complete the following steps.

1. After installing rpcapd, open the rpcapd configuration file (C:\Program Files\rpcapd\rpcapd.ini). The file contains text similar to the following:

```
ActiveClient = 10.0.0.100,2003
NullAuthPermit = YES
```

2. Specify an interface to monitor by adding the following line: `ifaddr=<interface_ip_addr>` or `ifname=<interface_name>`.
3. Send traffic to multiple ExtraHop appliances or from multiple interfaces on your device by adding another ActiveClient entry:

```
ActiveClient = <extrahop_management_ip>, <extrahop_rpcapd_port>,
ifname=<interface_name>
```

or

```
ActiveClient = <extrahop_management_ip>,
<extrahop_rpcapd_port>,ifaddr=<interface_ip_address>
```

where `<interface_name>` is the name of the interface from which you want to forward packets and `<interface_ip_address>` is the IP address of the interface from which the packets are forwarded. The `<interface_ip_address>` can be either an individual IP address, such as 10.10.1.100, or a CIDR specification that contains the IP address, such as 10.10.1.0/24.

The `<interface_name>` is formatted as `\Device\NPF_{<GUID>}`, where `<GUID>` is the globally unique identifier (GUID) of the interface. For example, if the interface GUID is 2C2FC212-701D-42E6-9EAE-BEE969FEFB3F, the interface name is `\Device\NPF_{2C2FC212-701D-42E6-9EAE-BEE969FEFB3F}`.

4. Save the configuration file.
5. Restart rpcapd by running the following command: `restart-service rpcapd`

## Example Windows configurations

The following example shows two interfaces in CIDR format.

```
ActiveClient = 10.10.6.45, 2003, ifaddr=10.10.1.0/24
ActiveClient = 10.10.6.45, 2003, ifaddr=10.10.2.0/24
NullAuthPermit = YES
```

The following example shows a configuration that forwards packets by interface name.

```
ActiveClient = 10.10.6.45, 2003,ifname=\Device\NPF_{2C2FC212-701D-42E6-9EAE-
BEE969FEFB3F}
ActiveClient = 10.10.6.45, 2003,ifname=\Device\NPF_{3C2FC212-701D-42E6-9EAE-
BEE969FEFB3F}
```

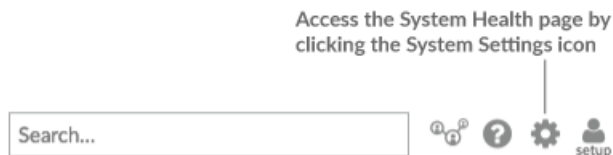
```
NullAuthPermit = YES
```

To reinstall rpcapd after changing the configuration file, run one of the following installation commands and replace `-RpcapIp` and `-RpcapPort` with the `-KeepConfig` flag to preserve the modified configuration file:

```
.\install-rpcapd.ps1 -MgmtIp <extrahop_management_ip> -KeepConfig
or
.\install-rpcapd.ps1 -InputDir . -KeepConfig
```

## Verify your RPCAP traffic

After your configuration is complete, you can view RPCAP packets and throughput metrics on the System Health page to verify that the correct traffic is being forwarded to the Discover appliance.



Learn more about [System Health charts](#).

## RPCAP packets

Displays the rate of remote packet capture (RPCAP) for all RPCAP peers, expressed in packets per second, on the ExtraHop Discover appliance.

This chart also has the following metrics:

### Total

The total number of RPCAP packets captured in the selected time interval.

### Current

The number of RPCAP packets captured during the most recent second.

### Max

The maximum number of RPCAP packets captured in the selected time interval.

The total, current, and maximum metrics are divided into the following categories:

### Encapsulation

The total number of RPCAP-encapsulated packets received by the Discover appliance.

### Tunnel Eligible

The total number of RPCAP packets eligible to be forwarded to the Discover appliance.

### Tunnel Sent

The total number of RPCAP-tunneled packets forwarded to the Discover appliance.

### Tunnel Received

The total number of RPCAP-tunneled packets received by the Discover appliance.

The chart title contains the number of RPCAP peers. You can click the chart to open a second chart that displays the RPCAP packet metrics on a per-peer basis.

The RPCAP chart is only displayed if remote packet capture is enabled on the Discover appliance.

## How this information can help you

Consult this chart after the initial setup of RPCAP to ensure that data is captured from every remote device on which RPCAP is deployed.

## RPCAP throughput

Displays the rate of RPCAP throughput metrics for all RPCAP peers, expressed in bytes per second, on the ExtraHop Discover appliance.

This chart also has the following metrics:

### Total

The total number of RPCAP bytes transferred in the selected time interval.

### Current

The number of RPCAP bytes transferred during the most recent second.

### Max

The maximum number of RPCAP bytes transferred in the selected time interval.

The total, current, and maximum metrics are divided into the following categories:

### Encapsulation

The total number of RPCAP-encapsulated bytes received by the Discover appliance.

### Tunnel Received

The total number of RPCAP-tunneled bytes received by the Discover appliance.

The chart title contains the number of RPCAP peers. You can click the chart to open a second chart that displays the RPCAP throughput metrics on a per-peer basis.

The RPCAP chart is only displayed if remote packet capture is enabled on the Discover appliance.

### How this information can help you

Monitor this chart to ensure efficient usage of RPCAP resources and ensure that the Discover appliance can accommodate increases in RPCAP throughput.


## Sample RPCAP configuration

The following sample configurations illustrate how traffic rules apply to packet forwarding.

In all scenarios below, the ExtraHop Discover appliance (EDA) interface has a network configuration of 172.25.26.5, 172.25.26.0/24 and is configured for RPCAP, as displayed in the following figure.

Scenario 1: The Discover appliance is configured to accept all interface traffic, as displayed in the following figure.

### Add RPCAP Port Definition

Port:	<input type="text" value="2003"/>
Interface Address:	<input type="text" value="*"/> 
Interface Name:	<input type="text"/>
Filter:	<input type="text"/>
Berkeley packet filter syntax	


Saving RPCAP settings will restart the capture



Client Network Configuration	RPCAP Configuration (rpcapd.ini)	Traffic Forwarded
eth0 = 10.10.1.20, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003	All traffic on eth0.
eth0 = 10.10.1.21 10.10.1.0/24  eth1 = 192.168.4.21, 192.168.4.0/24	ActiveClient=172.25.26.5, 2003	All traffic on eth0. No traffic from eth1.
eth0 = 10.10.1.21, 10.10.1.0/24  eth1 = 192.168.4.21, 192.168.4.0/24	ActiveClient=172.25.26.5, 2003, ifname=eth1	All traffic on eth1. No traffic from eth0.
eth0 = 10.10.1.21, 10.10.1.0/24  eth1 = 192.168.4.21, 192.168.4.0/24	ActiveClient=172.25.26.5, 2003, ifname= eth0  ActiveClient=172.25.26.5, 2003, ifname = eth1	All traffic on both eth0 and eth1.

Scenario 2: The Discover appliance is configured to accept traffic from only the device eth1 interface, as displayed in the following figure.

### Add RPCAP Port Definition

Port:	<input type="text" value="2003"/>
Interface Address:	<input type="text"/> 
Interface Name:	<input type="text" value="eth1"/>
Filter:	<input type="text"/> Berkeley packet filter syntax

Saving RPCAP settings will restart the capture

<input type="button" value="Save"/>	<input type="button" value="Cancel"/>
-------------------------------------	---------------------------------------


Client Network Configuration	RPCAP Configuration (rpcapd.ini)	Traffic Forwarded
eth0 = 10.10.1.20, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003	No traffic is forwarded.
eth0 = 10.10.1.21, 10.10.1.0/24  eth1 = 192.168.4.21, 192.168.4.0/24	ActiveClient=172.25.26.5, 2003	No traffic is forwarded.
eth0 = 10.10.1.21, 10.10.1.0/24  eth1 = 192.168.4.21, 192.168.4.0/24	ActiveClient=172.25.26.5, 2003, ifname=eth1	All traffic on eth1. No traffic from eth0.

Client Network Configuration	RPCAP Configuration (rpcapd.ini)	Traffic Forwarded
eth0 = 10.10.1.21, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003, ifname= eth0	All traffic on eth1. No traffic from eth0.
eth1 = 192.168.4.21, 192.168.4.0/24	ActiveClient=172.25.26.5, 2003, ifname = eth1	

Scenario 3: The Discover appliance is configured to accept all interface traffic for TCP port 80, as displayed in the following figure.

### Add RPCAP Port Definition

Port:

Interface Address:  

Interface Name:

Filter:   
Berkeley packet filter syntax

Saving RPCAP settings will restart the capture

Save

Cancel

Client Network Configuration	RPCAP Configuration (rpcapd.ini)	Traffic Forwarded
eth0 = 10.10.1.20, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003	Only port 80 traffic on eth0.
eth0 = 10.10.1.21, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003	Only port 80 traffic on eth0. No traffic from eth1.
eth1 = 192.168.4.21, 192.168.4.0/24		
eth0 = 10.10.1.21, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003, ifname=eth1	Only port 80 traffic on eth1. No traffic from eth0.
eth1 = 192.168.4.21, 192.168.4.0/24		
eth0 = 10.10.1.21, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003, ifname=eth0	Only port 80 traffic on eth0.

Scenario 4: The Discover appliance is configured to only accept TCP port 80 traffic from the eth1 interface, as displayed in the following figure.

## Add RPCAP Port Definition

Port:	<input type="text" value="2003"/>
Interface Address:	<input type="text"/>
Interface Name:	<input type="text" value="eth1"/>
Filter:	<input type="text" value="tcp port 80"/> Berkeley packet filter syntax

Saving RPCAP settings will restart the capture

Save

Cancel

Client Network Configuration	RPCAP Configuration (rpcapd.ini)	Traffic Forwarded
eth0 = 10.10.1.20, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003	No traffic is forwarded.
eth0 = 10.10.1.21, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003	No traffic is forwarded.
eth1 = 192.168.4.21, 192.168.4.0/24		
eth0 = 10.10.1.21, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003, ifname=eth1	Port 80 traffic on eth1. No traffic from eth0.
eth1 = 192.168.4.21, 192.168.4.0/24		
eth0 = 10.10.1.21, 10.10.1.0/24	ActiveClient=172.25.26.5, 2003, ifname=eth0	Only port 80 traffic on both eth1 and eth0.
eth1 = 192.168.4.21, 192.168.4.0/24	ActiveClient=172.25.26.5, 2003, ifname=eth1	

## Opening ports on your firewall

RPCAP forwards packets over a range of UDP ports that are determined by the TCP ports configured in the Discover or Trace appliance and the model of your appliance.

**Important:** Opening four ports might be sufficient for most environments. However, we recommend that you open a full 32 ports to avoid losing traffic from your RPCAP-installed devices. If opening 32 ports on your firewall is a concern, you can follow the guidelines in the table below. If you are not receiving all expected traffic, contact [ExtraHop Support](#).

To determine the range of UDP ports that should be opened on your firewall, complete the following calculations:

- For the lower end of the UDP port range, take the lowest TCP port listed in the set of rules on the Discover or Trace appliance.
- For the higher end of the UDP range, take the lowest number and add the number associated with your ExtraHop appliance model, as listed in the following table.

ExtraHop Appliance	Number of Ports	Example Range
EDA 1000v, ETA 1150v	1	2003
EDA 2000v, EDA 3100	4	2003-2006
EDA 6100, EDA 6100v, ETA 6150, ETA 6150v	8	2003-2010
EDA 8100	16	2003-2018
EDA 9100	32	2003-2034
EDA 10200	72	2003-2074

For advanced users, you can also manually modify the lowest port of the UDP range through the following Running Configuration file setting: `rpcap:udp_port_start`.