Monitor DNS errors in a dashboard

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The Domain Name System (DNS) is an essential service for resolving hostnames to IP addresses. Any system that needs to locate and communicate with other systems depends on DNS.

While DNS is typically a resilient service that you might not worry much about, DNS server errors can wreak havoc on the end-user experience for email, authentication systems, websites, and databases.

To monitor when and where DNS errors occur on your network, we recommend that you build a dashboard in the ExtraHop system. Dashboards include multiple types of charts that reveal different types of information about a single metric, which can help shed light on the underlying cause of DNS errors.

This walkthrough shows you how to build a dashboard to answer the following questions:

- How many DNS errors do I have?
- What is the percentage of DNS errors on my network?
- When did the DNS errors occur?
- Which queries are causing DNS errors?
- Which DNS servers are returning the errors?
- Are DNS errors affecting the performance of my other servers (such as database or applications)?

Prerequisites

- You must have access to an ExtraHop Discover appliance with a user account that has limited or full write privileges.
- Your ExtraHop appliance must also have network data with DNS traffic.
- Familiarize yourself with the concepts in this walkthrough by reading the Dashboards topic.

If you do not have access to DNS server data or the right privileges for the Discover appliance, you can perform this walkthrough in the ExtraHop demo.

Create a dashboard

When you first log into the ExtraHop Web UI, you see a dashboard called the Activity dashboard. To create your own dashboard to display DNS metrics, complete the following steps:

1. On the bottom left of the Dashboard page, click **New Dashboard**.
2. In the Title field of Dashboard Properties, type a name for your dashboard. For this walkthrough, type `DNS Errors`.
3. Click **Create**. When you create a new dashboard, a workspace opens in an editable layout mode. This workspace contains a single region and two empty widgets: a chart and a text box.
4. Text box widgets can include custom explanatory text about a dashboard or chart. For this walkthrough, however, we won't be adding text. Delete the text box by completing the following steps:
   a) Click the command menu ⋮ in the upper right corner of the text box widget and select **Delete**.
   b) Click **Delete Widget**.

Next steps

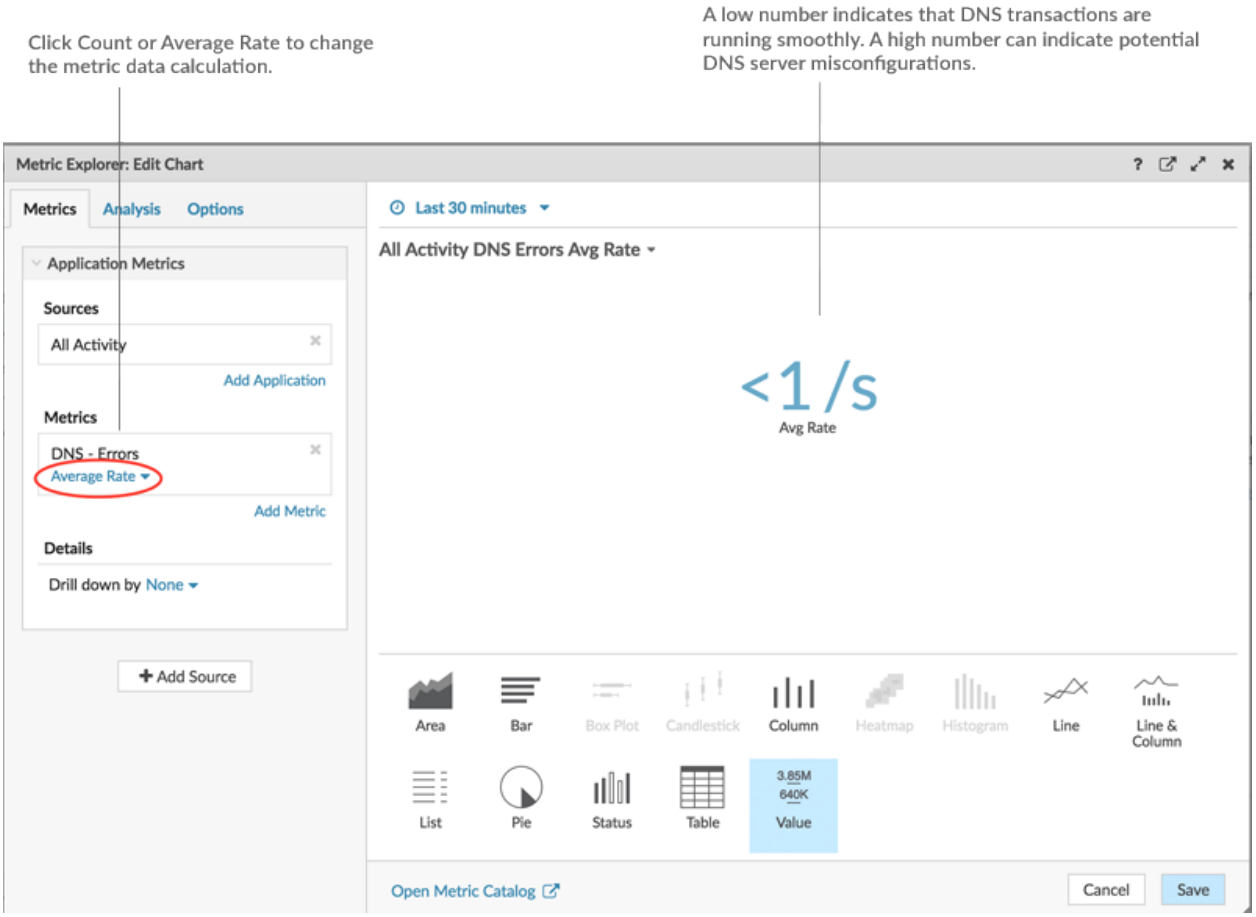
Let's add DNS error metrics to the empty chart.

How many errors do I have?

These steps show you how to create a chart to display the DNS error rate for a specified time interval.

To build dashboard charts in this walkthrough, you'll select the All Activity application as a source. All Activity is a metric source that is available by default to all users and contains metrics about all of the devices discovered on your network.

1. Click the empty chart widget in your newly created dashboard to open the Metric Explorer.
2. Click **Add Source**.
3. In the Sources field, type `All Activity` to filter the results, and then select **All Activity**.
   If you are building your dashboard in the Command appliance, select an All Activity application for a connected Discover appliance.
4. In the Metrics field, type `DNS errors` to filter the results from all of the available metrics, and then select **DNS Errors**.
5. From the bottom of the page, click the **Value** chart.
6. Click **Count** and select **Average Rate**.



7. Click **Save** to return to your dashboard.

Next steps

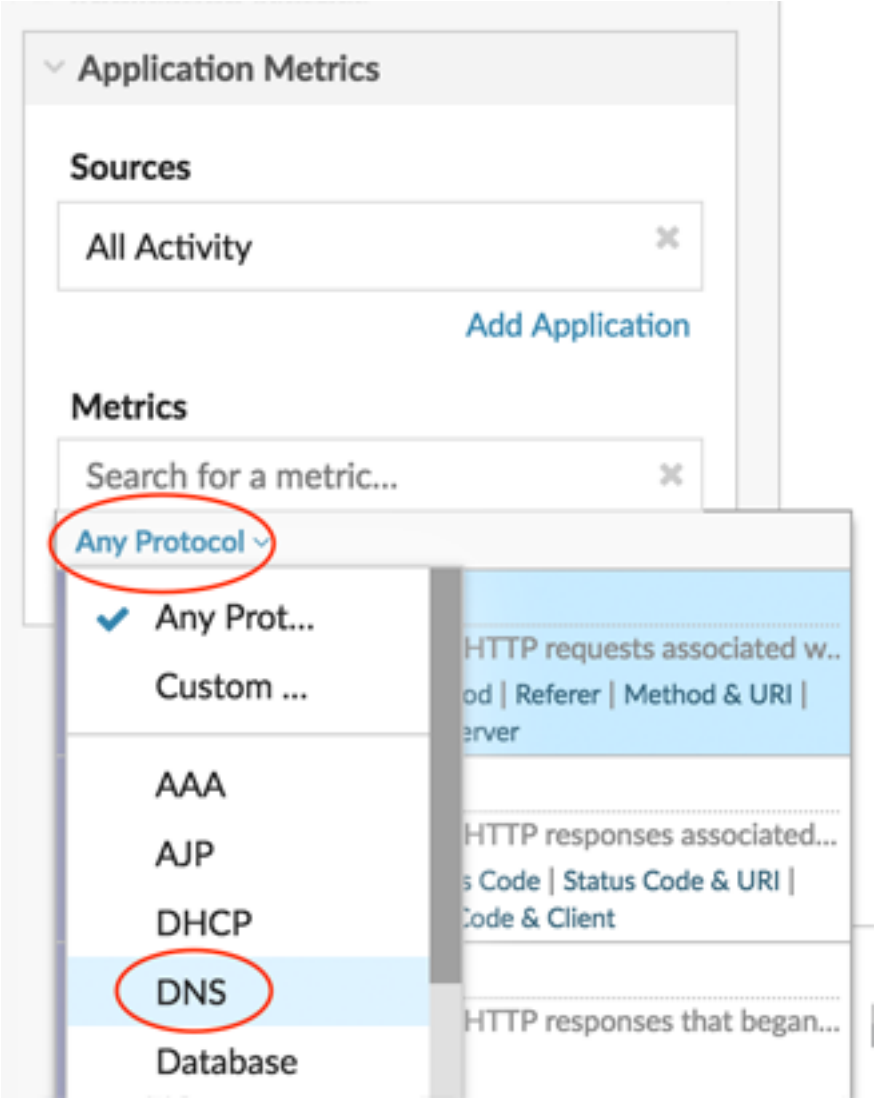
Let's continue to add more DNS error charts to reveal a bigger picture about DNS errors on your network.

What is the percentage of errors happening on my network?

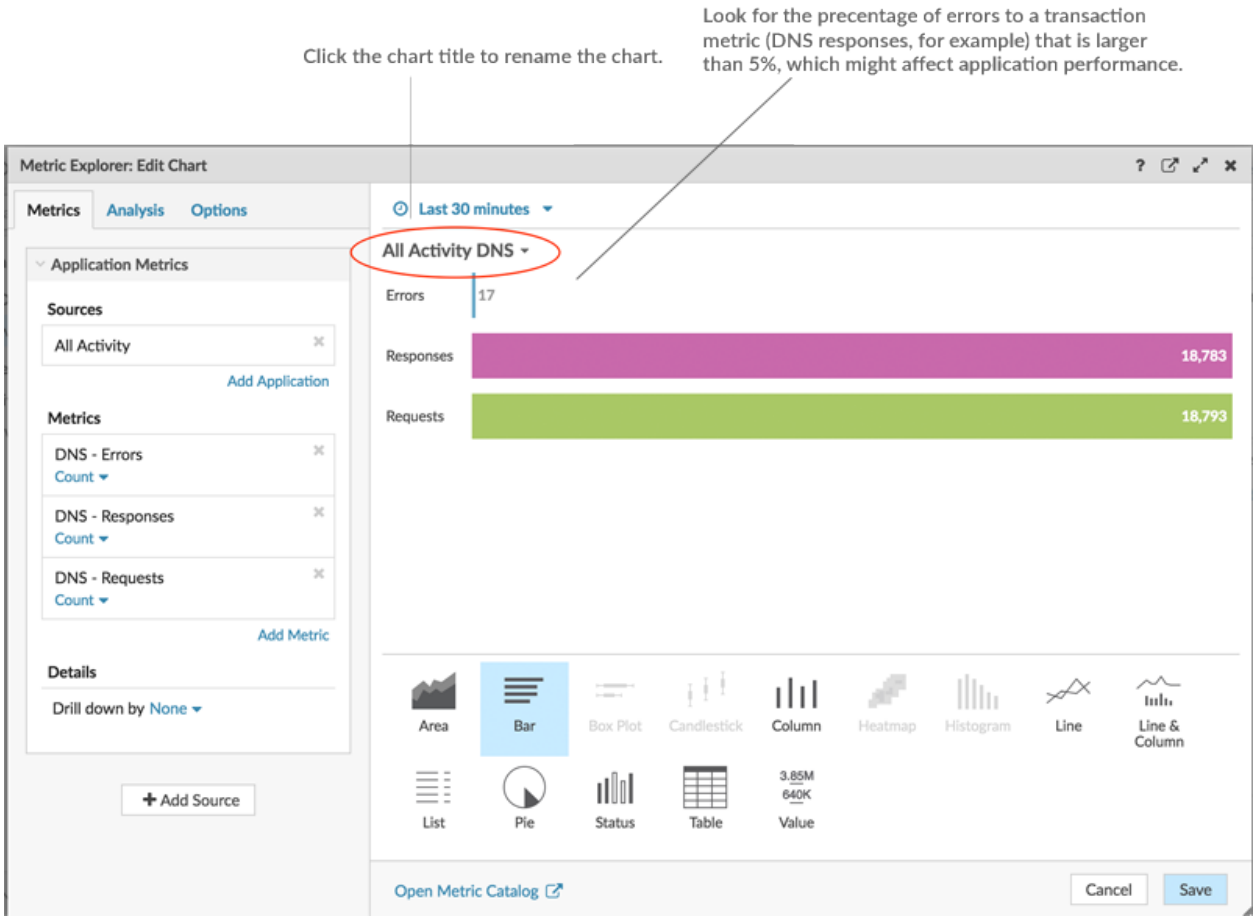
Comparing the number of DNS errors to the number of DNS transactions (requests and responses) can help you gauge the scope of DNS issues on your network.

1. From the bottom of the page, click and drag a chart widget into the empty space next to the DNS error rate chart.

2. Click the chart.
3. Click **Add Source** and select **All Activity**.
4. In the Metrics field, click **Any Protocol** and select **DNS**. This shortcut can help you narrow down your search for metrics by protocol.



5. Type `errors` to filter results and then select **DNS Errors**.
6. From the bottom of the page, click the **Bar** chart.
7. Click **Add Metric**.
8. Click **Any Protocols** and select **DNS** from the drop-down menu.
9. Type `responses` and select **DNS Responses**.
10. Click **Add Metric**.
11. Click **Any Protocols** and select **DNS** from the drop-down menu.
12. Type `requests` and select **DNS Requests**.
13. Click the chart title and select **Rename**. Type `Error Percentage` in the custom title field.



14. Click **Save**.

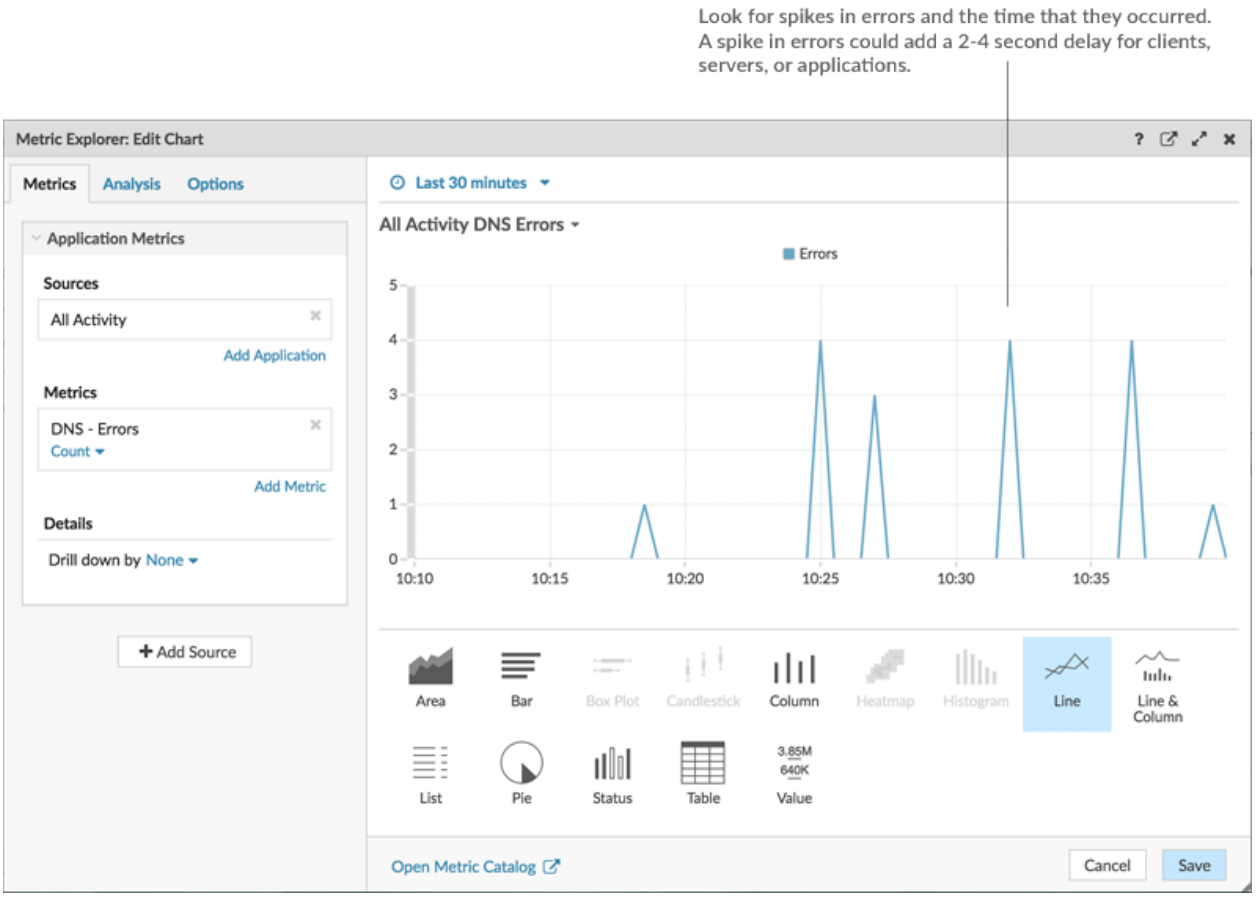
Next steps

You can now calculate the ratio of DNS errors to DNS transactions.

When did the DNS errors occur?

Now that you have determined the scope of DNS errors, let's take a look at when the errors occurred and how they changed over time.

1. Click and drag a new chart widget from the bottom of the page into an empty space on the region.
2. Click the chart.
3. Click **Add Source**, select **All Activity**, and then select **DNS Errors**.
4. From the bottom of the page, click **Line** chart.



5. Click **Save**.

Next steps

You now have three charts that help you visualize the health of DNS transactions occurring on your network. Next, let's add charts that help you drill into the cause of DNS errors and see the effect they're having on your overall network.

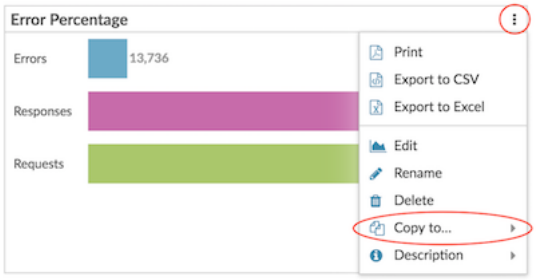
Which host queries are causing the DNS errors?

A host query is sent by a client to retrieve the IP address for a hostname (for example, for "extrahop.com") from a DNS server. If the DNS server responds to the query with an error, the server might be misconfigured for the domain associated with the hostname.

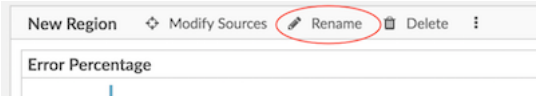
You can drill down on the DNS error metric in a chart to display up to 20 of the top hostname queries that contributed to the total number of DNS errors on your network.

Before adding a new host queries chart to your dashboard, let's first add another region to the dashboard to better organize the current charts into logical groups.

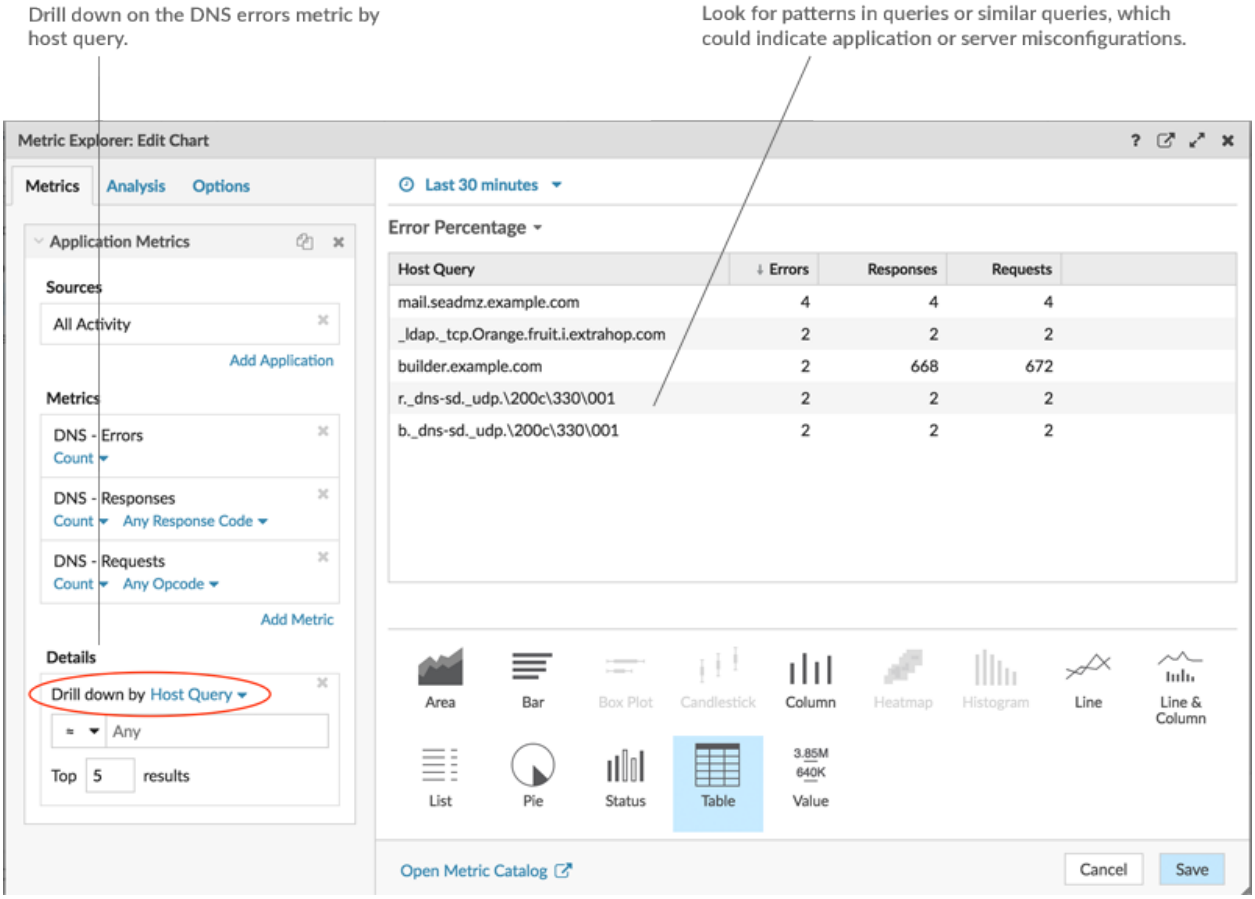
1. On the "Error Percentage" chart, click the command menu ⋮ in the upper right corner.



2. Hover over **Copy to...** and select the name of your dashboard from the menu. This step creates a copy of the chart in a new region. The most recently created dashboards are listed at the bottom of the menu.
3. In the new region, click **Rename**. Type `DNS Error Details` and click **Save**.



4. Click the chart.
5. Click the chart title and type **DNS Errors by Host Query**.
6. From the bottom of the page, click **Table**.
7. In the Details section, click **Drill down by <None>** and select **Host Query**.



Tip: To display more queries, type a larger number into the Top results field. You can view up to 20 drill-down items in a dashboard chart.

8. Click **Save**.

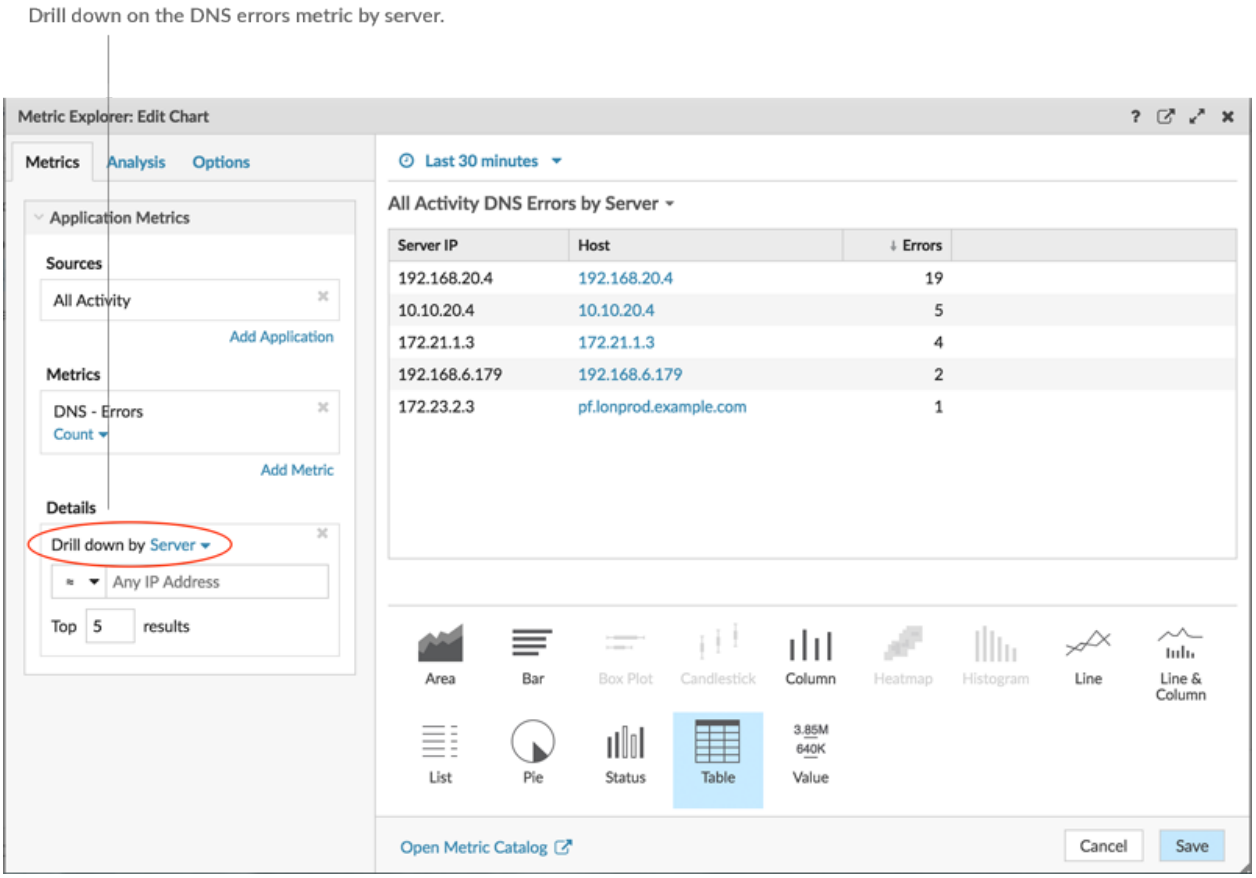
Next steps

After identifying queries that are not resolving or causing errors, you can begin to troubleshoot the DNS server configurations in your network environment.

Which DNS servers are returning errors?

Knowing which servers are returning DNS errors and how many errors each server sent can help you troubleshoot DNS issues.

1. Click and drag the corner of the region to make room for two more charts.
2. Click and drag a chart widget from the bottom of the page.
3. Click the chart.
4. Click Add Source, select All Activity, and then select DNS Errors.
5. From the bottom of the page, click **Table**.
6. In the Details section, click **Drill down by <None>** and select **Server**.



7. Click **Save**.

Next steps

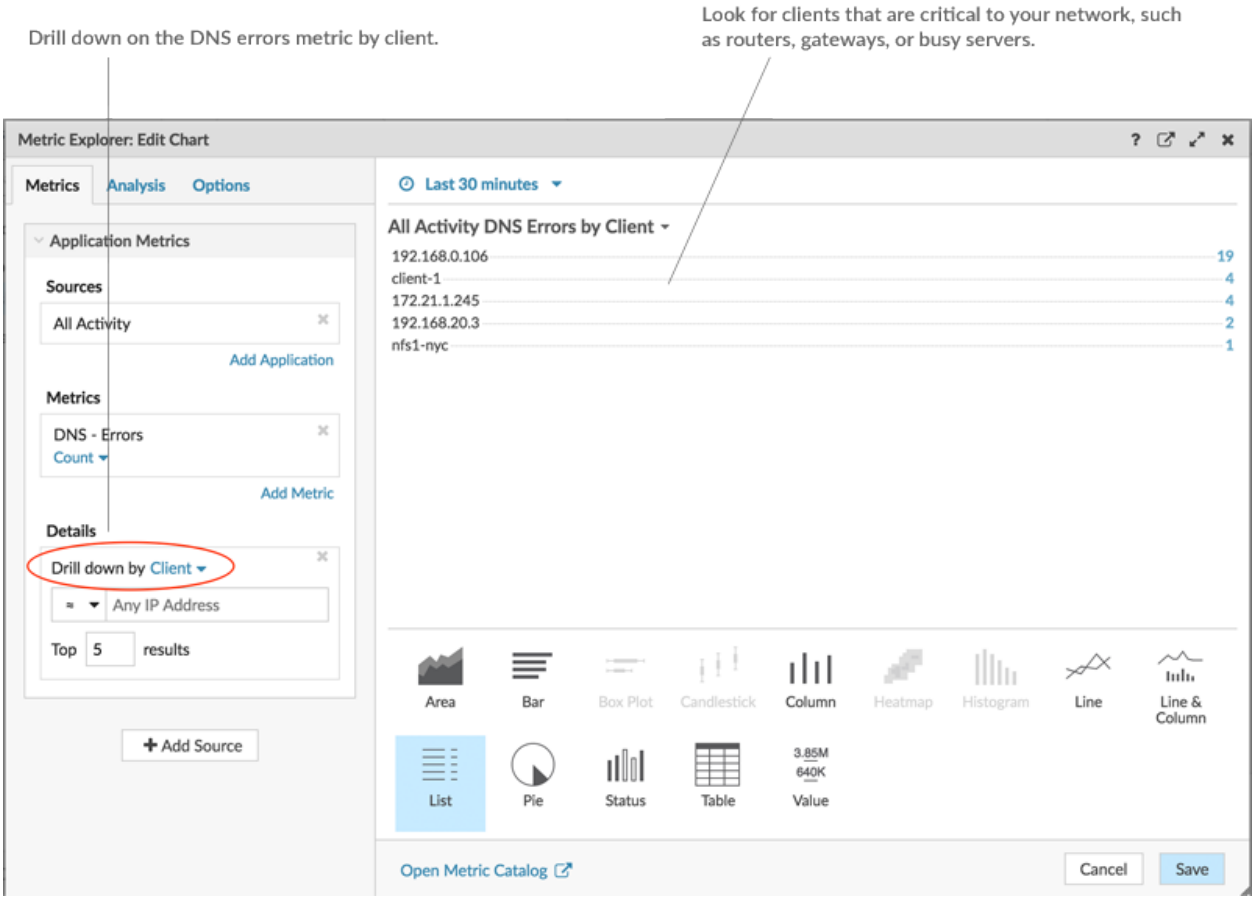
You can now determine which servers sent the most DNS errors, potentially due to server misconfigurations.

Are DNS errors affecting the performance of my other servers?

You can determine which applications, databases, and other servers are negatively affected by DNS errors. Let's create a chart that breaks down the number of DNS errors by the clients that received the most errors.

1. From the bottom of the page, drag and drop a chart widget into an empty area.

2. Click the chart.
3. Click **Add Source**, select **All Activity**, and then select **DNS Errors**.
4. From the bottom of the page, click the **List** chart.
5. In the Details section, click **Drill down by <None>** and select **Client**.



Note: You can add a sparkline to your list chart to view how the number of metrics for each client changed over time. Click the Options tab and select **Include sparkline**.

6. Click **Save**.
7. At the top right corner of the dashboard page, click **Exit Layout Mode**.

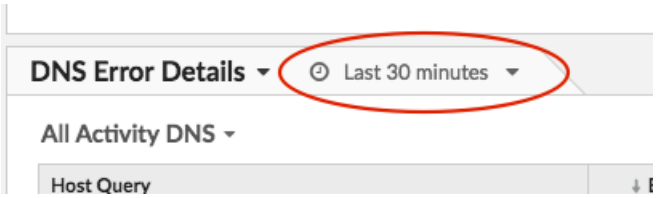
Next steps

Your dashboard is complete! You can now monitor DNS errors for troubleshooting. The following sections offer additional tips for analyzing DNS issues from your dashboard.

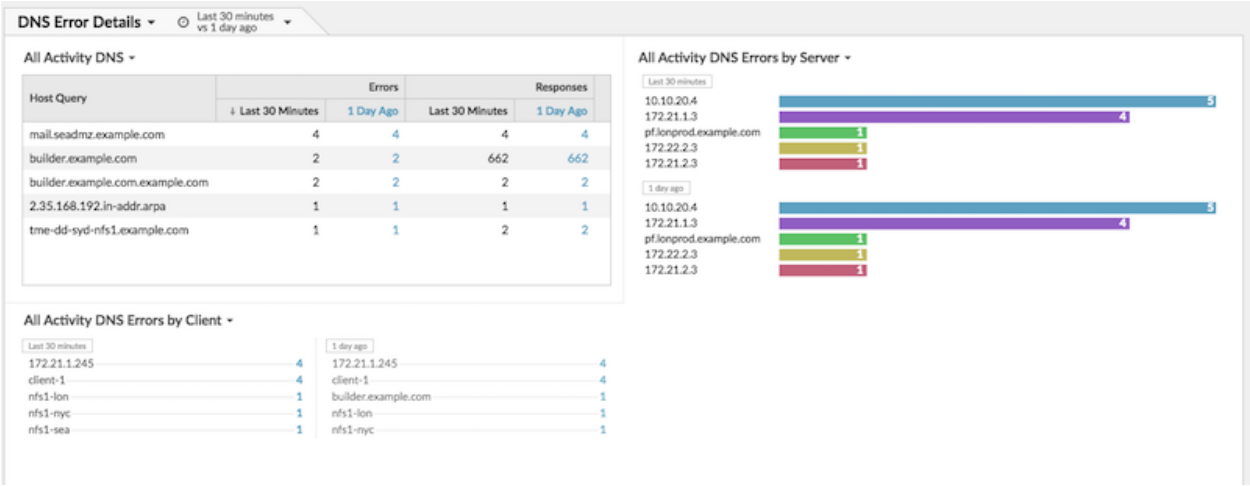
Compare different time intervals

By applying a delta comparison of time intervals to your charts, you can see changes in data from two time intervals side-by-side.

1. Click the region title, "DNS Error Details," and select **Use Region Time Selector**.
2. Next to the DNS Error Details region header, click **Last 30 Minutes**.



3. Near the bottom of the time interval window, click **Compare**. You can now select two intervals to do a delta comparison of metrics from each time period. For this example, let's compare metrics from yesterday to the last 30 minutes.
4. Click **Save**. You will now see a comparison of metrics in all charts within the region, as shown in the figure below.



Note: You can do a delta comparison for the entire dashboard by changing the global time interval. The global time interval is located at the top left corner of the dashboard page.

5. To remove the delta comparison, click **Last 30 minutes vs 1 day ago** in the region header, click **Remove Delta**, and then click **Save**.

Additional DNS metrics to monitor

DNS errors are one source of information about the health of DNS traffic in your network. The following table has additional metrics that you can add to your dashboard to answer the following questions:

Question	DNS metric	Description
Are DNS servers dropping requests?	DNS Request Timeouts	DNS requests that don't receive a response from a DNS server are potential bottlenecks. Server timeouts can cause slowdowns and breakage for servers, clients, and applications.
Are there security breaches related to DNS?	DNS Requests, drill down by host query and filter for "WPAD" or "ISATAP."	Web Proxy Auto Discovery (WPAD) and Intra-Site Automatic Tunnel Addressing Protocol (ISATAP) are examples of host queries that are related to known security risks.
Is the network affecting DNS transactions?	DNS Round Trip Time	Round trip time (RTT) is calculated by observing the time it takes

Question	DNS metric	Description
		for packets to travel across the network between devices. A high RTT can indicate network latency.