Splunk4Industry: Manufacturing

Lab Guide

Overview

This lab guide contains the hands-on exercises for the **Splunk4Industry: Manufacturing** workshop. Before proceeding with these exercises, please ensure that you have a copy of the Splunk4Industry slide deck, which will help to put into context the tasks you are carrying out.

Download the workshop slide deck: https://splk.it/Manu-Attendee

Prerequisites

In order to complete these exercises, you will need your own Splunk instance. Splunk's hands-on workshops are delivered via the Splunk Show portal and you will need a splunk.com account in order to access this.

If you don't already have a Splunk.com account, please create one here before proceeding with the rest of the workshop.

Registering for a Splunk.com Account

To help reduce any additional identity verification checks during the registration process, please use full names and full company names where possible, avoiding nicknames and abbreviations. Please see Splunk.com Registration Best Practices for more details.

⚠️ Troubleshooting Connectivity

If you experience connectivity issues with accessing either your workshop environment or the event page, please try the following troubleshooting steps. If you still experience issues please reach out to the team running your workshop.

- **Use Google Chrome** (if you're not already)
- If the event page (i.e. *https://show.splunk.com/event/<eventID>*) didn't load when you clicked on the link, try **refreshing the page**
- **Disconnect from VPN** (if you're using one)
- **Clear your browser cache and restart your browser** (if using Google Chrome, go to: Settings > Privacy and security > Clear browsing data)
- **Try using private browsing mode** (e.g. Incognito in Google Chrome) to rule out any cache issues
- **Try using another computer** such as your personal computer - all you need is a web browser! Cloud platforms like AWS can often be blocked on corporate laptops.

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Exercise 1 – Access Your Lab Environment

Description

You'll need a Splunk instance to do these hands-on exercises – time to get one!

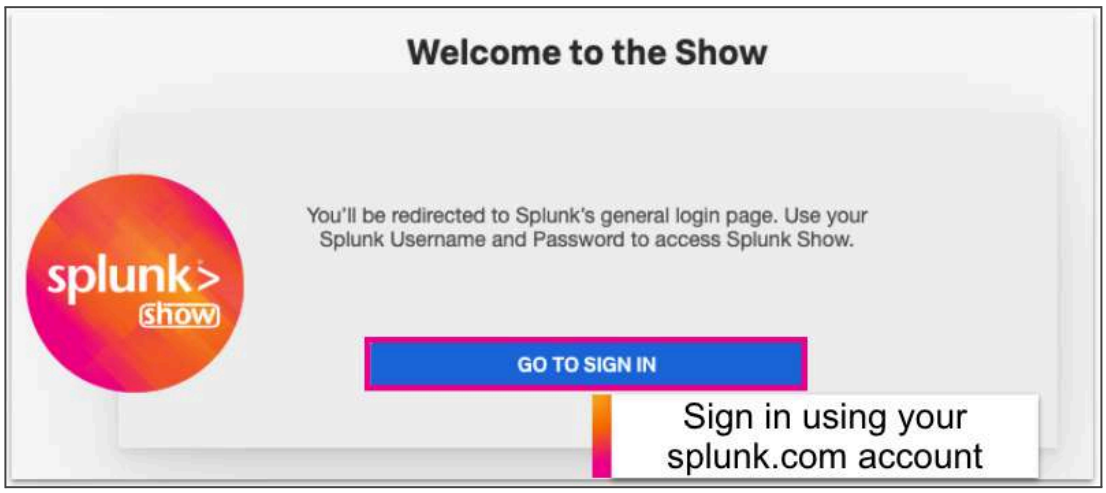
In this exercise, you will create your own Splunk Enterprise instance using our Splunk Show portal.

Already been given your Splunk instance details?

If your workshop host has already provided you with your instance URL and login details then you do not need to follow the instructions in exercise 1 of this lab guide - you can skip straight to exercise 2!

Steps

1. Browse to https://show.splunk.com and log in using your **Splunk.com account**.

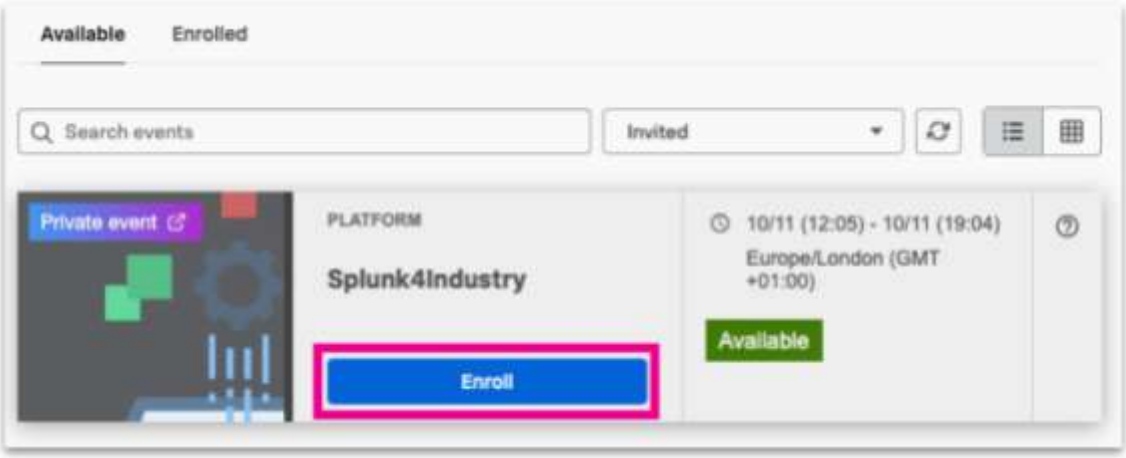


Don't have a Splunk.com Account?

To access our hands-on workshop events you will need a Splunk.com account. If you don't already have a Splunk.com account, don't worry - it only takes a few minutes to create one! Please create one here.

2. Once logged in to Splunk Show you will see the event page for the event that you have been invited to. If no events are listed, try selecting '**Invited**' from the dropdown list.

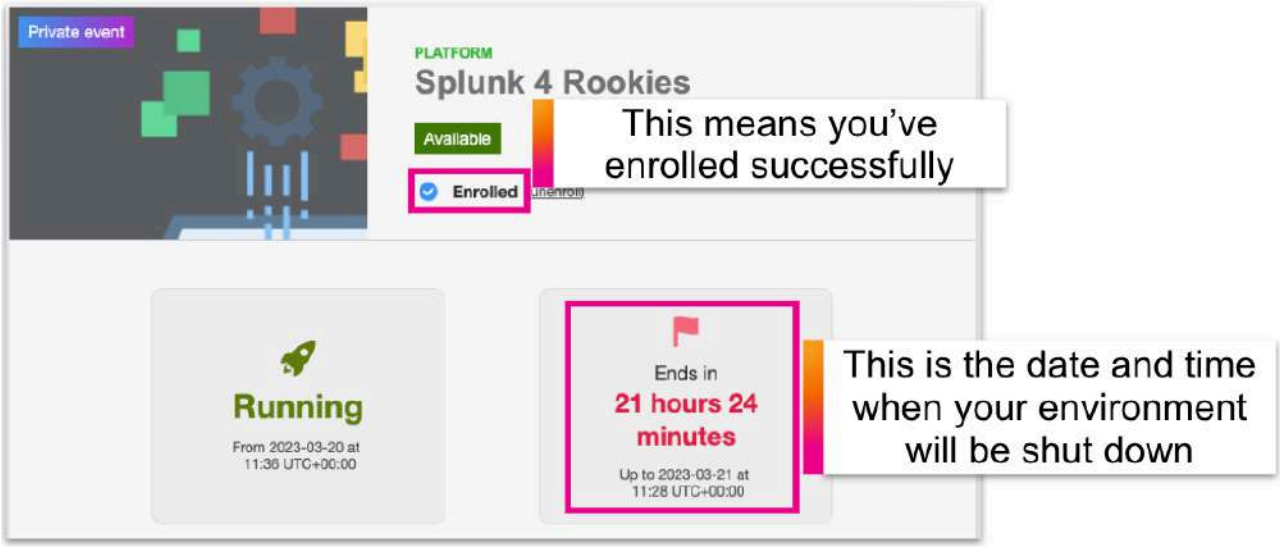
   Click on **Enroll** to join the event.



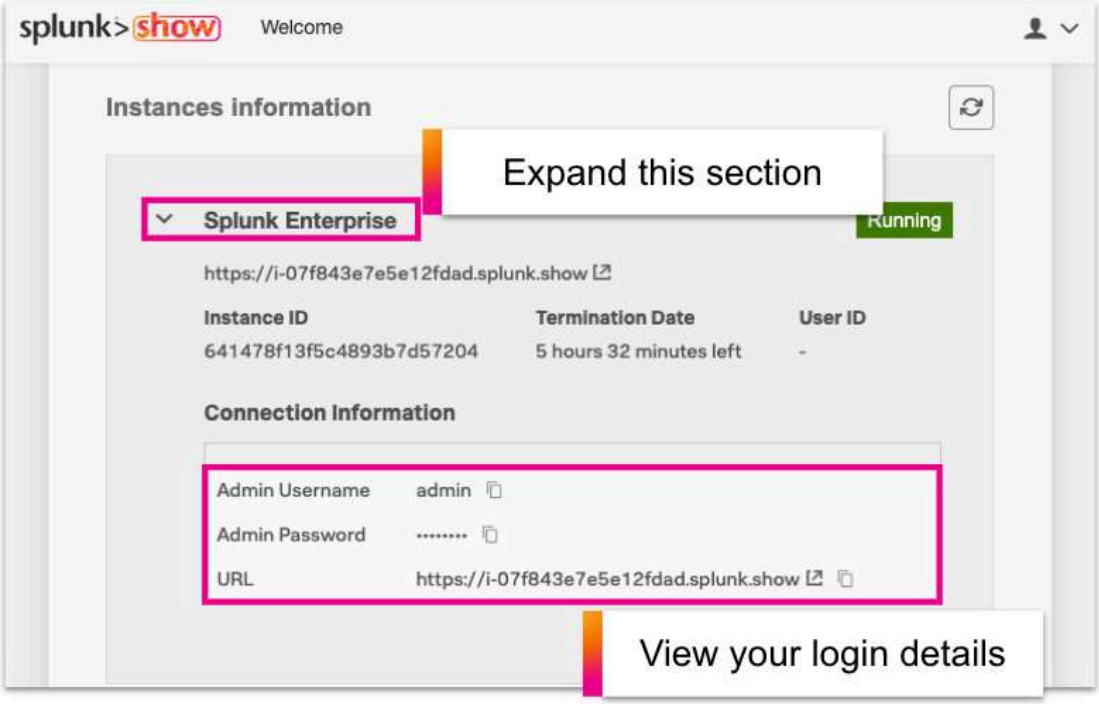
The page will refresh and the event will now display 'Enrolled'.

🕐 Lab environment expiration

All Splunk environments that are part of this workshop event will automatically be shut down at the date and time specified on this screen so feel free to continue to play around with your lab environment until then!

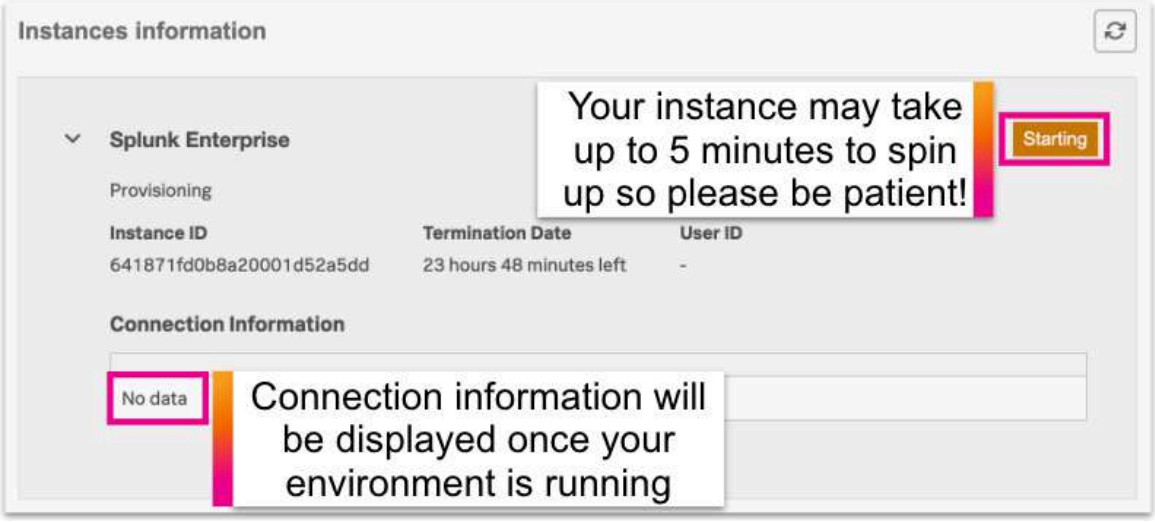


3. Scroll down the page to the **Instances Information** section and expand out the 'Splunk Enterprise' section to locate the user credentials and link to your lab environment.



⚠️ **No connection information shown?**

If you don't see any connection information displayed yet it means that your lab environment is currently starting up. Please try refreshing this view in a few minutes.



Exercise 2 – Create an App and Add Data to Splunk

Description

Splunk apps and add-ons provide customisable content and capabilities for a variety of technologies and use cases, accelerating the time it takes to get value from your data. They're also a great way to organise and share your content - such as reports and dashboards - to Splunk users. Anyone can build apps and add-ons, and today we're going to create our own app that contains a dashboard.

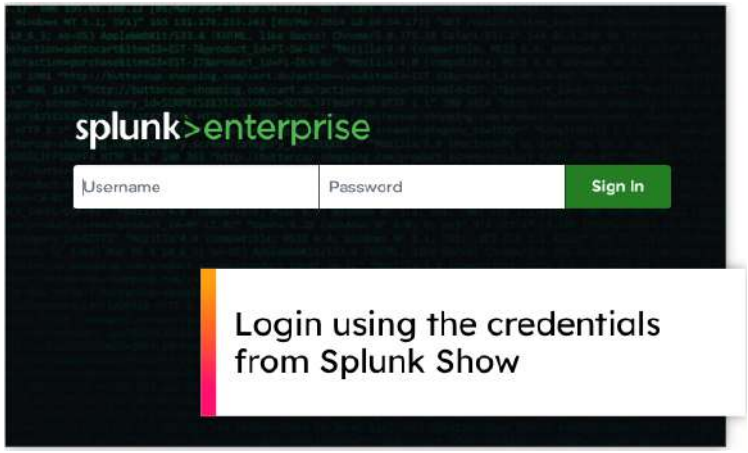
Since Splunk is a data platform, we'll also need to load some data in before we can do anything!

In this exercise, you will create a new app and then add some data to your Splunk Enterprise instance. We will configure Splunk to monitor some sample web server logs, which are currently being generated on the same server that Splunk is running on.

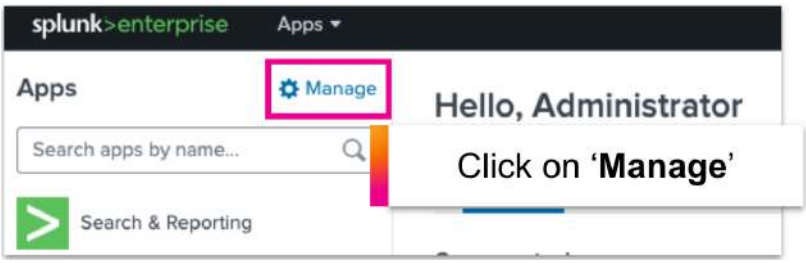
Steps

1. Browse to your Splunk instance by using the unique URL link provided in the Splunk Show event (see step 3 of [Exercise 1 - Access Your Lab Environment](#).)

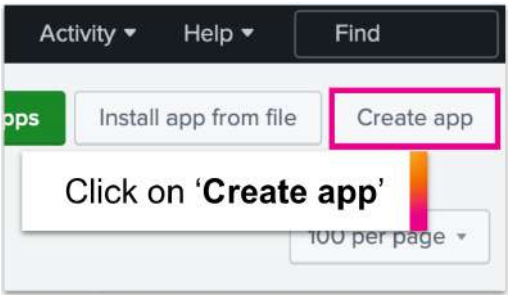
2. Log in using the credentials from the Splunk Show event.



3. On the left side of the page, under the **Apps** section, click on **Manage**.



4. On the top right corner of the screen, click on **Create app**.



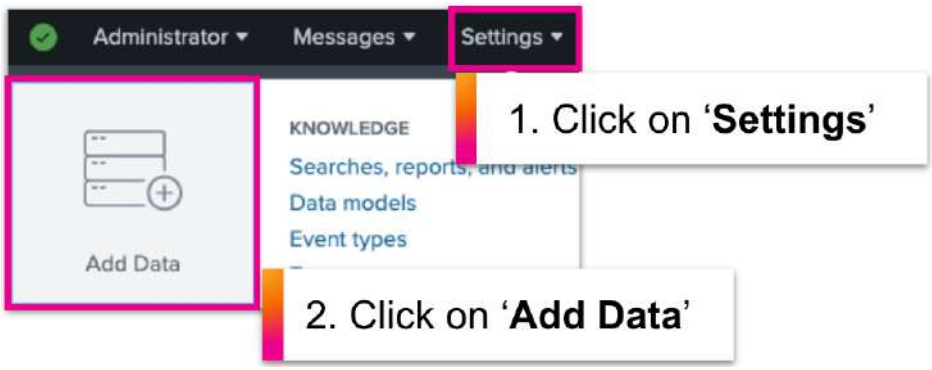
5. Give your app a name and enter a folder name. Leave all other values as they are and click on **Save**.

6. Now that our blank app has been created, we need to select the app so that everything we do from now on will be created and saved within the new app.

   To select your app, click on the **Apps** dropdown list at the top left of the page and select your app.

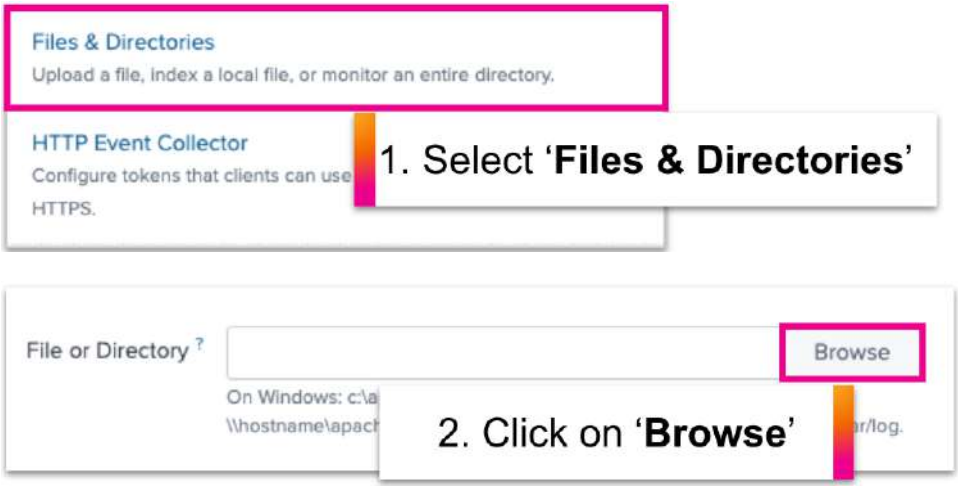
Now let's add some data!

7. With our new app still selected from the dropdown list, go to **Settings** > **Add Data**.

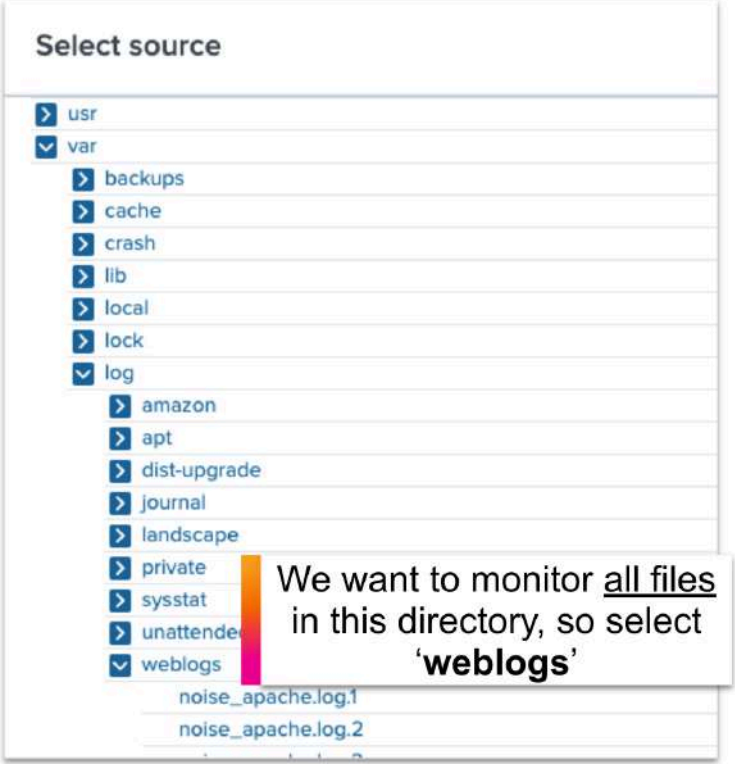


8. For this exercise we will monitor a directory, as this will allow us to pick up new data as it is generated by the web server. To do this, click on '**Monitor**'.

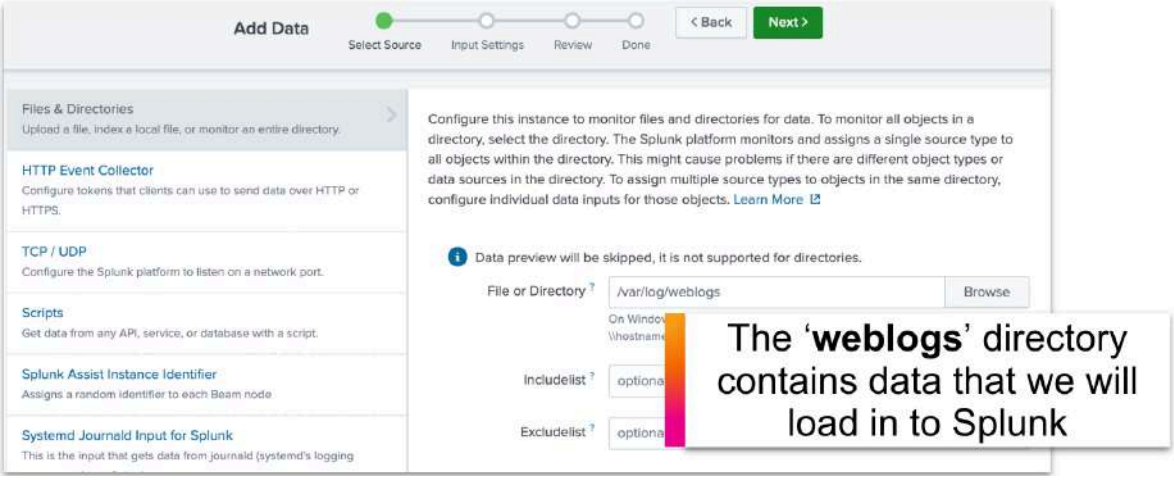
9. Select '**Files & Directories**' and then click '**Browse**'.



10. Browse to **/var/log** and select the **weblogs** directory. Click on **Select** to choose this directory.

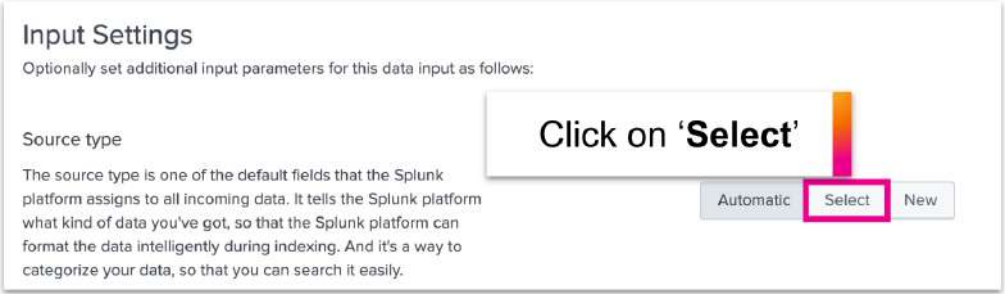


11. Check that the directory path is correct (**/var/log/weblogs**) and click on **Next**.

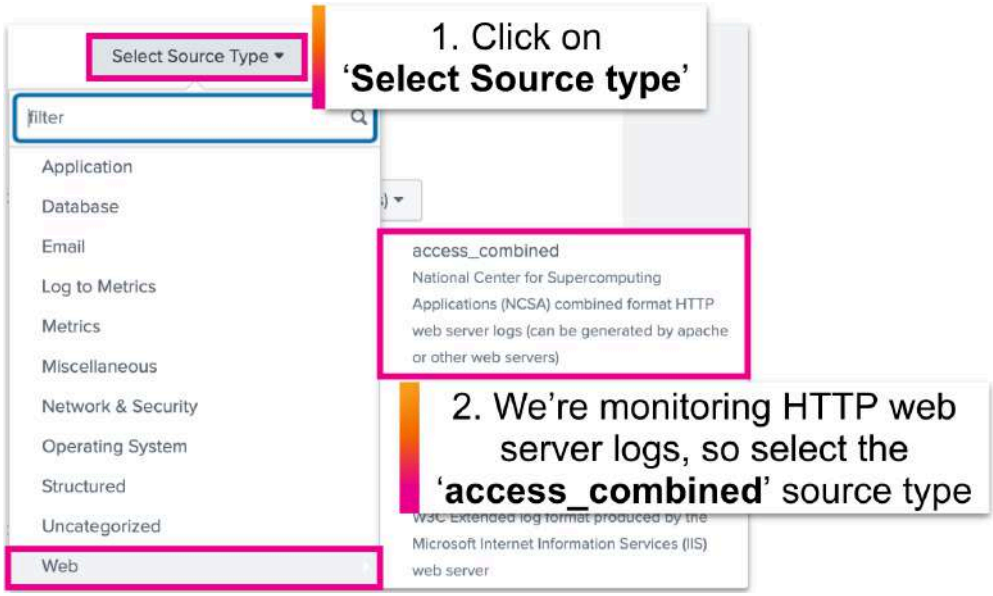


12. Now we need to select a source type for this data. A source type determines how Splunk formats the data during the indexing process. Splunk comes with a large set of predefined source types and can often detect the source type automatically. However, for this exercise you will specify the source type.

On the **Input Settings** screen, to the right of the **Source type** section, click on **Select**.



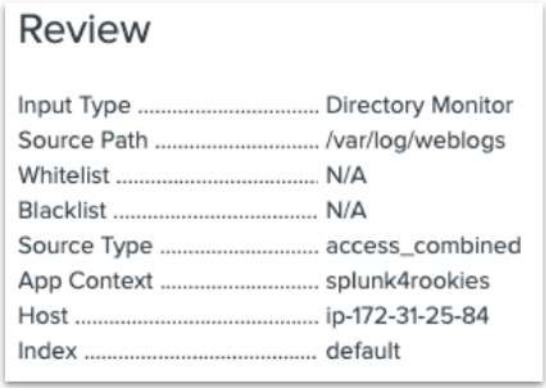
13. Click on the **Select Source Type** dropdown list and browse to **Web > access_combined**. Alternatively, you can start typing 'access' in the **filter** field and the 'access_combined' source type should appear.



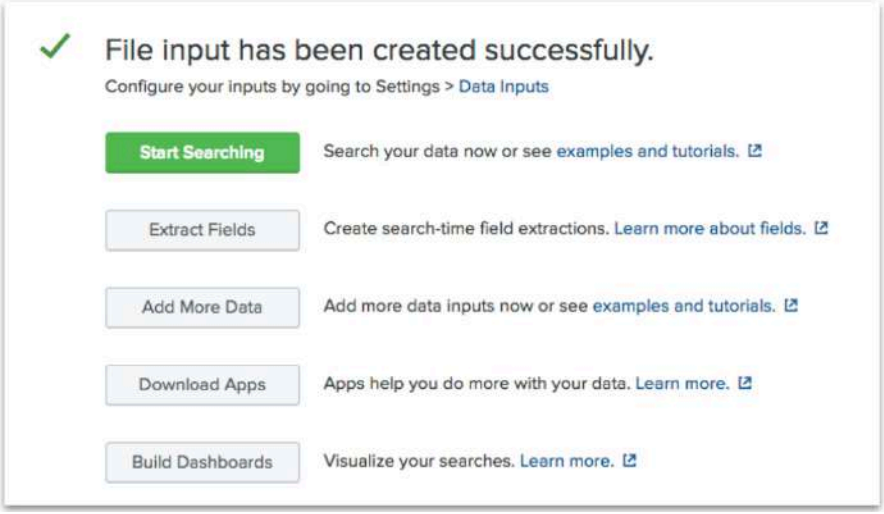
14. For the **App Context**, ensure that your new app is selected from the list.

15. Leave all other values as default and click on **Review**.

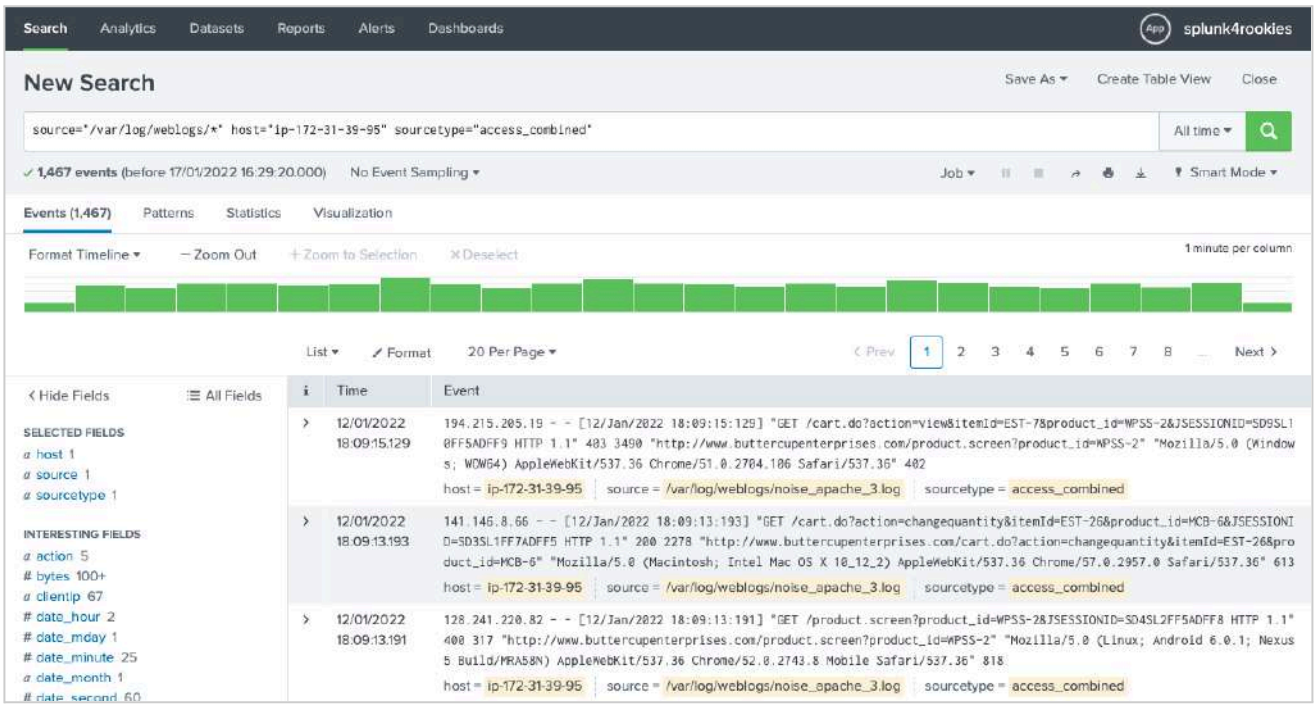
16. Review your settings and click on **Submit**.



17. You should now receive a message stating that your '**File input has been created successfully**'. Click on **Start Searching** to search the data you have just added to Splunk.



You should now see the raw events being shown in Splunk.



Start Exploring Your Data

Description

In this exercise, you will try some basic Splunk searches using the Search section of your new app.

Steps

1. Click on the Splunk logo in the top left corner of the screen to take you back to the default home screen.

2. Under the **Apps** section on the left of the page, click on the new app that you created in task 2 (Note: the name will be whatever you entered when you created it.)

3. To search, just type any word or phrase into the search bar and Splunk will search for all events that contain those words.

   So enough talking – let's try some searches!

   Firstly, set the time picker (to the right of the search bar) to **Last 60 minutes**. Your environment has an event generator running in the background, which is constantly creating sample data for you to use. This data started being generated from the moment you registered for your Splunk environment, so let's stick to the last 60 minutes of data…

   Try the following search:

```
503 purchase
```

   This will return all events from Splunk that contain the number '**503**' and the word '**purchase**'.

ℹ️ **Spaces between words in a search**

In Splunk, a space between two words is an implied Boolean 'AND', meaning that Splunk will automatically search for events containing both words – you don't need to specify it.

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4. That's great, but what if there are events with the word '*purchased*', '*purchasing*', or '*purchaser*', for example? Well, we can use a wildcard asterisk (*****) to search for any events containing '**503**' and any word beginning with '**pur**':

```
503 pur*
```

A wildcard is useful if we want to be a bit more flexible with what we're searching for.

5. Remember the '`AND`' operator we mentioned in step 3? Well you can also use the other Boolean operators as well: `OR` and `NOT`. Note that these must be in UPPERCASE.

Let's try using one of these operators in a search:

```
503 (purchase OR addtocart)
```

This search will return all events containing the number '**503**' and either the word '**purchase**' or the word '**addtocart**'.

6. So far, we've just been searching for text – those numbers could appear anywhere in our data, so how do we know that we're searching the right values? Depending on our data '**503**' could be a HTTP status code, or it could be part of a session ID or a phone number.

Well, we know we're looking at web logs, so let's include field/value pairs in our search to be more specific with what we're looking for:

```
status=503 action=purchase
```

This will ensure that our results only return web server **purchase** events where the HTTP status code is '**503**'. Always specify field names where possible to ensure that your results are as accurate as possible!

ℹ️ **Search Best Practices**

In a production environment you will likely have much more data to search through than in today's workshop environment. As a best practice, always specify the index and sourcetype if you know them - it will make your searches MUCH faster!

Example:

```
index=main sourcetype=access_combined
```

For more information please see Write better searches in the Splunk docs.

Exercise 3 – IT Operations team: Investigate successful vs unsuccessful web server requests over time

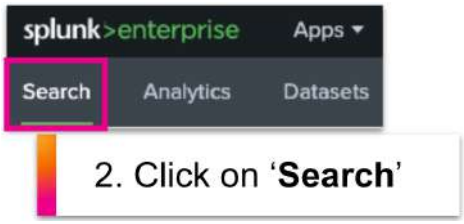
Description

The IT Operations team currently has no visibility of failures on the Buttercup Enterprises website.

In this exercise, you will produce a dashboard panel for the IT Operations team, showing website successes vs failures over time.

Steps

1. To start a new search, first make sure your app is selected from the Apps dropdown list and then click Search on the app menu bar.



2. Search the **main** index (i.e. the default index) for all web server events over the **Last 60 minutes**:

```
index=main sourcetype=access_combined
```

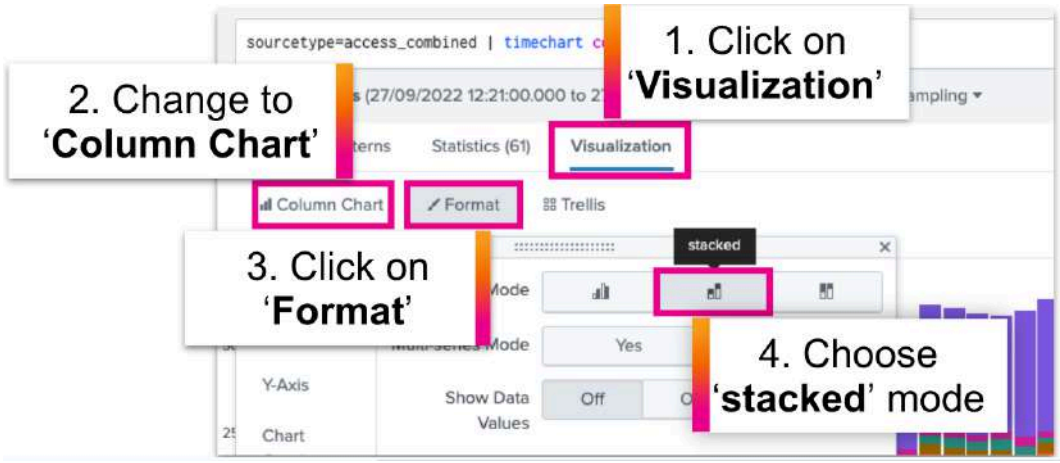
3. Scroll down the page and find the **status** field. Click on the field name to display the field window and select **Top values by time**.

Splunk will automatically populate your search as follows:

```
index=main sourcetype=access_combined | timechart count by status limit=10
```

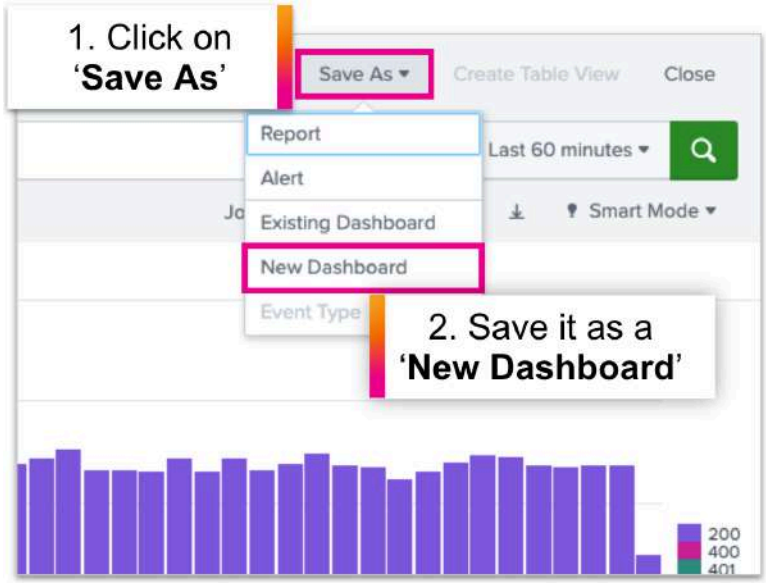
4. A chart will display on the **Visualization** tab. Change the visualization to a **Column Chart**.

   Click on **Format** and then on the **General** tab to change the **Stack Mode** to '**stacked**'. Feel free to play around with the formatting until you're happy with the visualization.



5. Now that we have a nice chart visualization, let's add it to a new dashboard so we can share this information with the business.

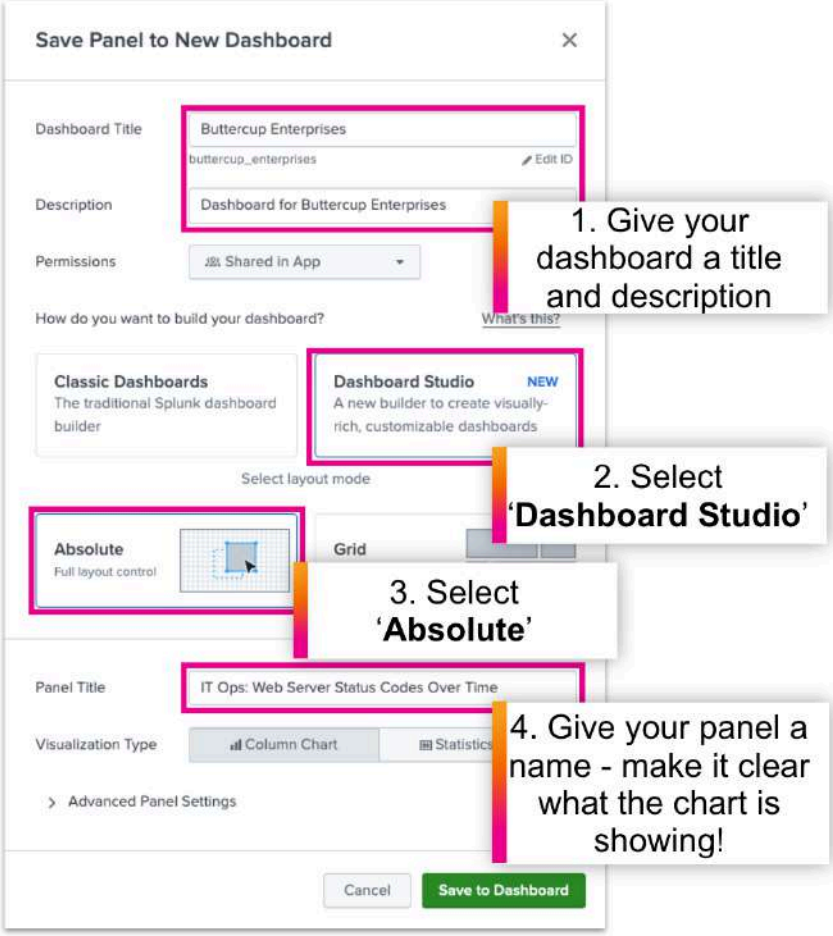
   In the top right corner of the screen, go to **Save As > New Dashboard**.



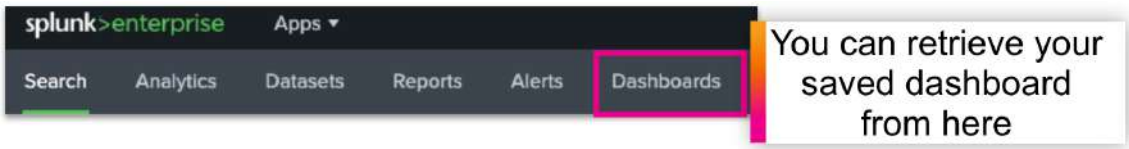
6. On the **Save Panel to New Dashboard** screen, give your dashboard a suitable title and optionally a description too. If you can't think of a name for your dashboard, call it '**Buttercup Enterprises**, or something else meaningful to you.

   Choose how you want to build your dashboard. For today's workshop we will use **Dashboard Studio**. For your layout mode, select **Absolute**.

   Give your panel a title – something that describes what this chart is showing, such as '**IT Ops: Web Server Status Codes Over Time**'.



7. Click on **Save to Dashboard** and then **View Dashboard**.
   Congratulations - you've just created a Splunk dashboard with your first panel! Anytime you want to access a dashboard, click on **Dashboards** in the menu bar and select the dashboard you wish to display. Go ahead – give it a try!



Exercise 4 – DevOps team: Show the most common customer operating systems and which web browsers are experiencing the most failures

Description

In this exercise, you will need to extract a new field from your events in order to create the report we need. To accomplish this, we will use Splunk's field extractor wizard.

Custom field extractions are useful in a variety of scenarios, such as:

- When you have custom data and Splunk did not recognise/extract a particular field that you need
- When you need to extract a particular part of an event in order to be able to search/report on that value

Steps

Extract a New Field

1. Click **Search** if you don't see the search bar displayed. Search for all web server events over the **Last 60 minutes**:

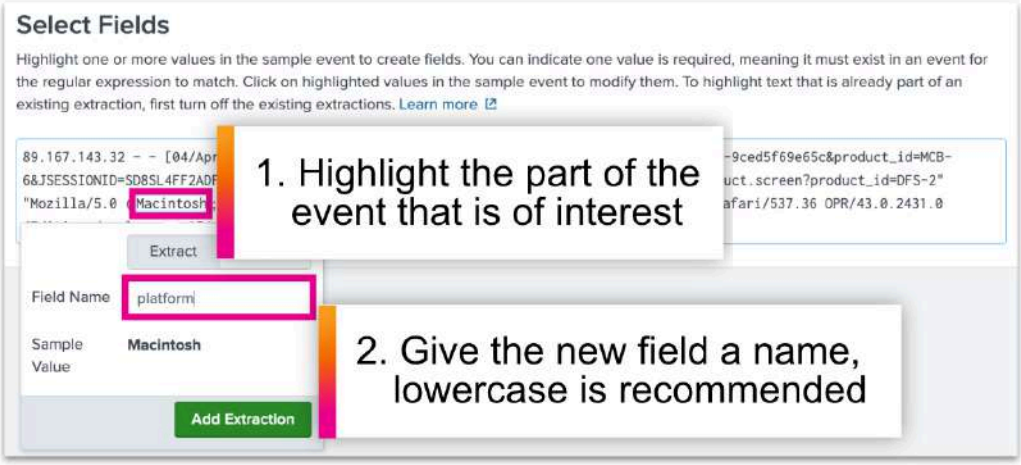
```
index=main sourcetype=access_combined
```

2. Expand out one of the events by clicking on the arrow (**>**) to the left of the event timestamp. Click on the **Event Actions** dropdown list and select **Extract Fields**:

3. We have two options for extracting fields: Regular Expression or Delimiters. For this exercise, we will choose Regular Expression. Click on **Regular Expression** and then click on **Next**.

4. You will now be presented with a sample event from which to extract your field. For this exercise, we will need to extract the platform (operating system) information from each event so we can report on it. Look for the platform/operating system information in your event (e.g. Linux, Macintosh, Windows, etc.) contained in the useragent string towards the end of the event and highlight it.

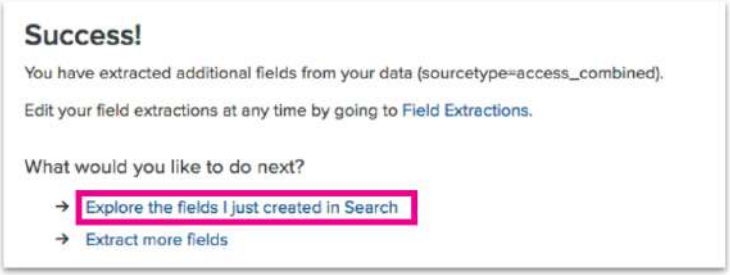
   Give the new field the following name: **platform** (field names are case sensitive, so be sure to use all <u>lowercase</u> letters for this to make your life easier!)



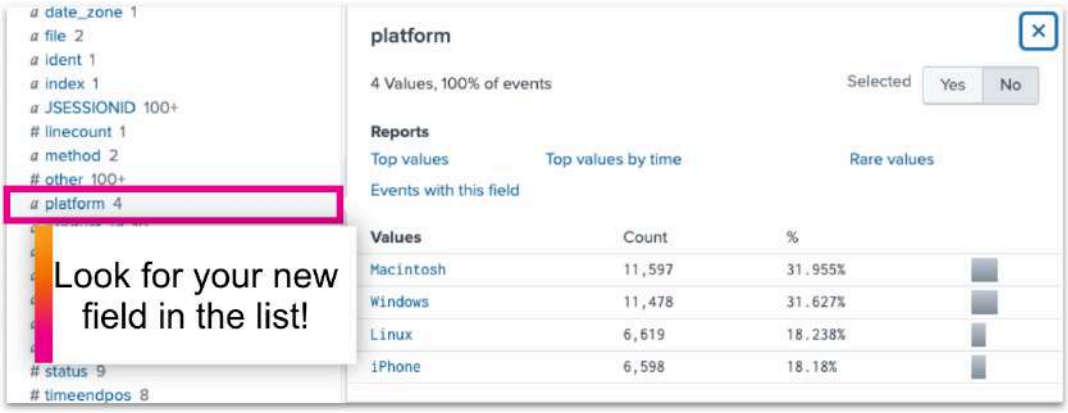
5. Click on **Add Extraction** and then click on **Next**.

6. Click on **Next** again to reach the **Save** screen. On the Save screen, click on **Finish** to save your new field extraction.

7. You should now see a **Success!** page. Click on **Explore the fields I just created in Search**.



8. Splunk will show you search results for all of your web server data over the last 24 hours. Scroll down the page and look for your new field listed on the left – you can now use it in your searches!



Show the most common customer operating systems

Now that we have our new field, we can use it to report for the DevOps team!

1. Search for all web server events over the **Last 60 minutes**:

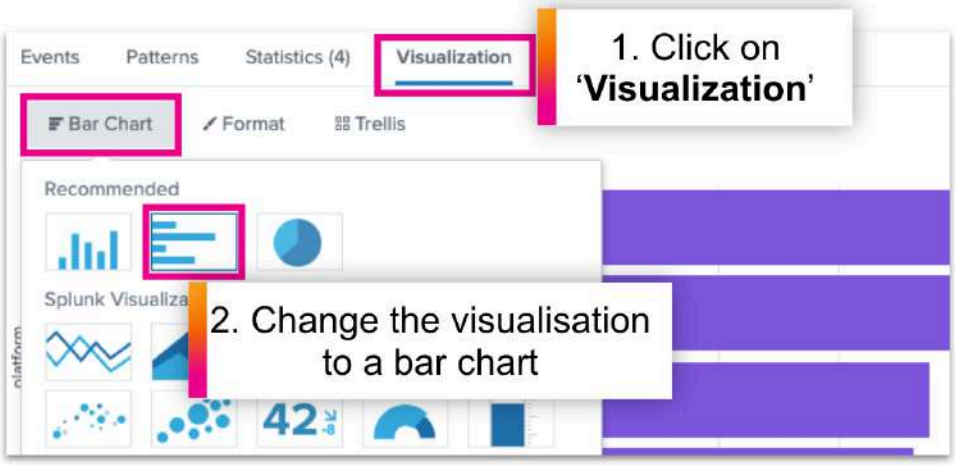
```
index=main sourcetype=access_combined
```

2. Scroll down the page and find the **platform** field that you just extracted. Click on the field name to display the field window, and then select **Top values**.

Splunk will automatically populate your search as follows:

```
index=main sourcetype=access_combined | top limit=20 platform
```

3. Select the **Visualization** tab if not already displayed and change the visualization to a **Bar Chart**.



ℹ️ **Tip for cleaning up your chart**

You can optionally add `showperc=f` to the `top` command to remove the 'percent' column from the table of statistics. This will help to keep the chart nice and clean when we view it on our dashboard later.

```
index=main sourcetype=access_combined | top limit=20 platform showperc=f
```

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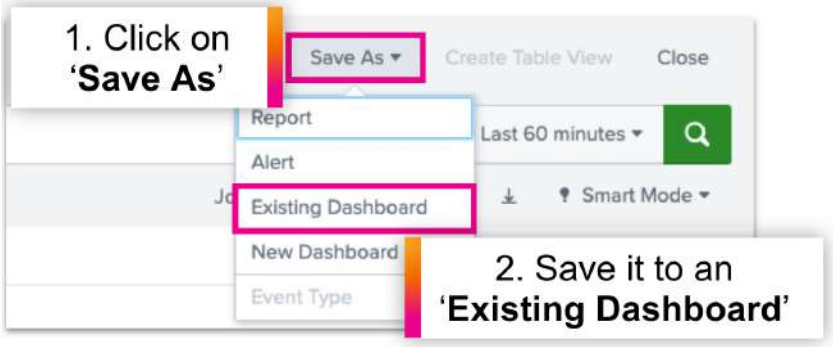
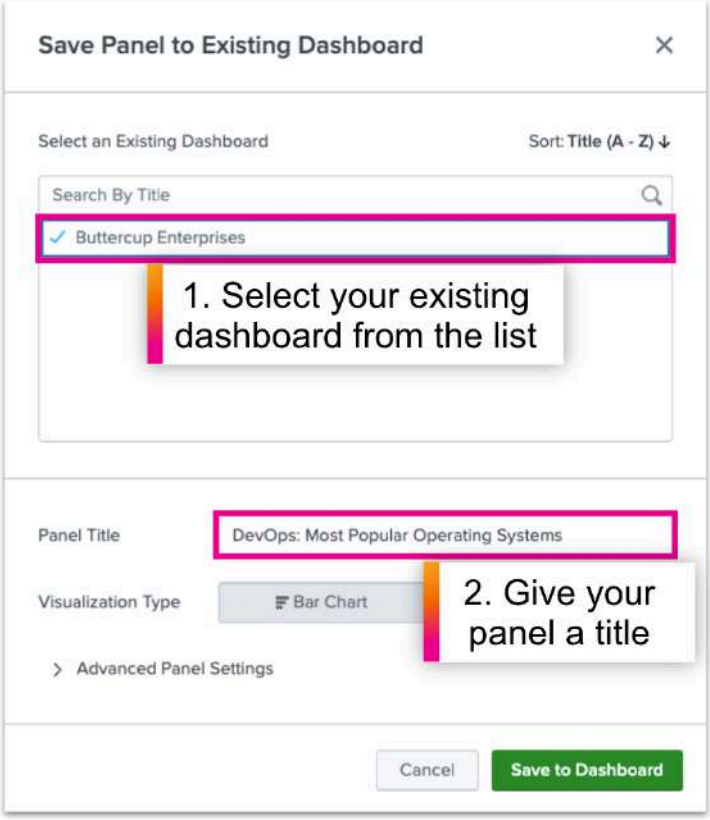
4. When you're happy with your chart, save it to an '**Existing Dashboard**' and select the dashboard you previously created from the list. Finally, give the dashboard panel a suitable title, such as '**DevOps: Most Popular Operating Systems**' and click on **Save to Dashboard**.





Show which web browsers are experiencing the most failures

One DevOps use case down, one more to go! We now need to report on failures by web browser.

1. Search for all web server events over the **Last 60 minutes**:

```
index=main sourcetype=access_combined
```

2. Add a search filter to return only events with a status code of 400 or higher (an event with a status value of 400 or higher is considered a failure of some kind.)

```
index=main sourcetype=access_combined status>=400
```

3. Scroll down the page and find the **useragent** field (Note: 'useragent' is a field containing information about the web browsers that are interacting with our website.) Click on the field name to display the field window and then select **Top values by time**.

Splunk will automatically populate your search as follows:

```
index=main sourcetype=access_combined status>=400
| timechart count by useragent limit=10
```

4. Select the **Visualization** tab if not already displayed and change the visualization to an **Area Chart**.

To make your chart cleaner, limit your output to the top 5 useragents by changing the “limit” to 5 in your search.

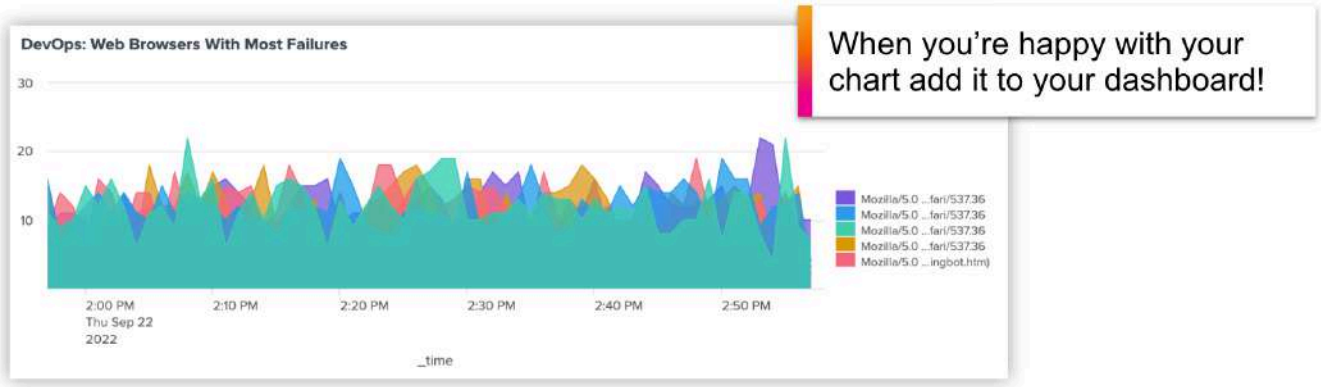
```
index=main sourcetype=access_combined status>=400
| timechart count by useragent limit=5
```

ℹ️ **Tip for cleaning up your chart**

You can optionally add `useother=f` to the `timechart` command to remove the ‘OTHER’ value from your chart.

```
index=main sourcetype=access_combined status>=400
| timechart count by useragent limit=5 useother=f
```

When you’re happy with your chart, add it to your dashboard and give the panel a title such as ‘**DevOps: Web Browsers With Most Failures**’.



Note: Remember to add it to your <u>existing</u> dashboard rather than creating a new one!

Exercise 5 - Manufacturing: exploring additional use cases

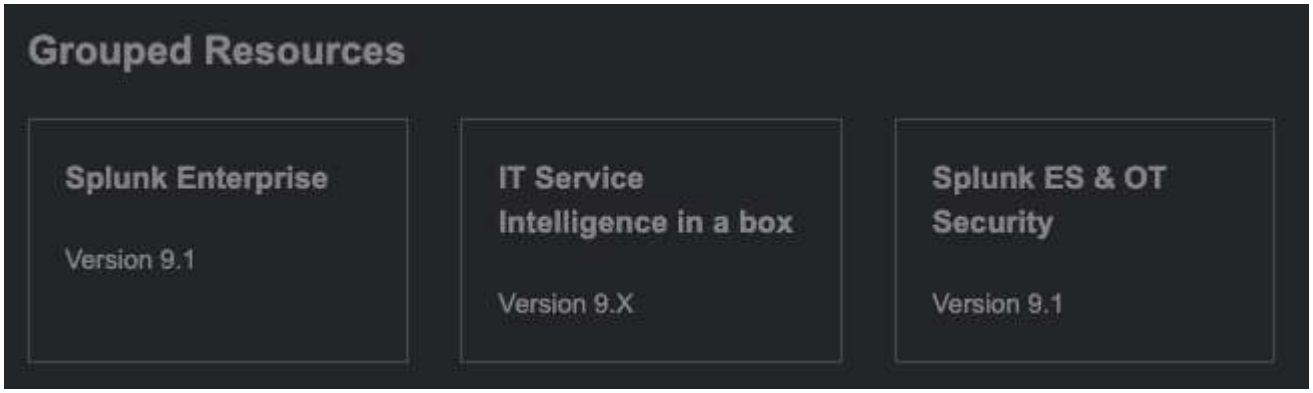
Description

Now that you have some experience with searching and investigating data in Splunk, we'll take a look at working with some non-traditional IT data. Remember that Splunk can handle any type of machine data, across security, ITOps, IoT and Industrial IoT. For this exercise, we will experiment with insights we can get into data coming from Wind Turbines. Think about how you could apply these techniques across Manufacturing. What data do you have in your organisation that you'd like to explore?

Steps

Switch lab instance

For this exercise, you will need to switch demo instance to "Splunk ES & OT Security". This instance will have its own username and password credentials. Ask for assistance if needed, to locate the demo instance and credentials:



Explore the data

Create a new app for this exercise E.g. "Manufacturing Insights"

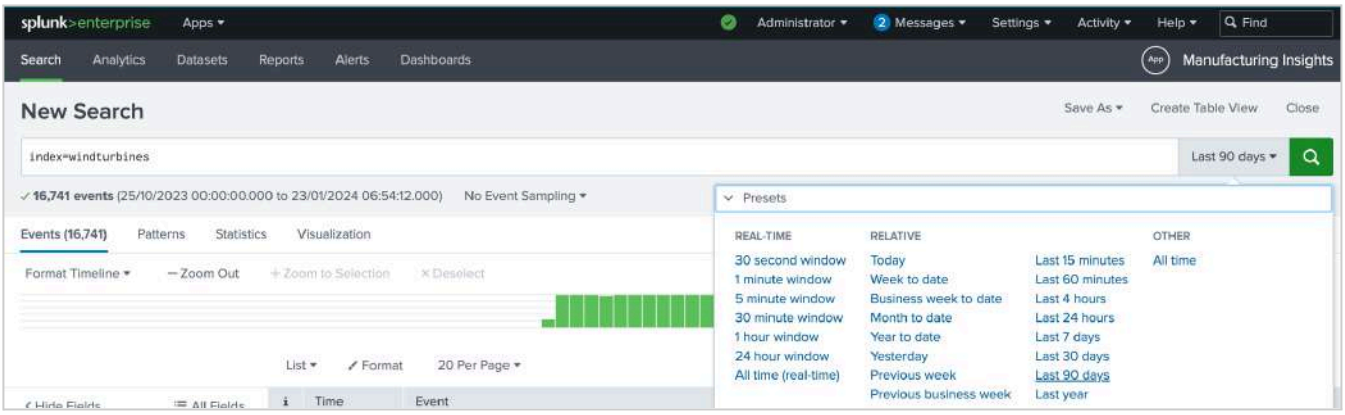
and save

Navigate to the new app, by selecting it from the Apps drop-down menu

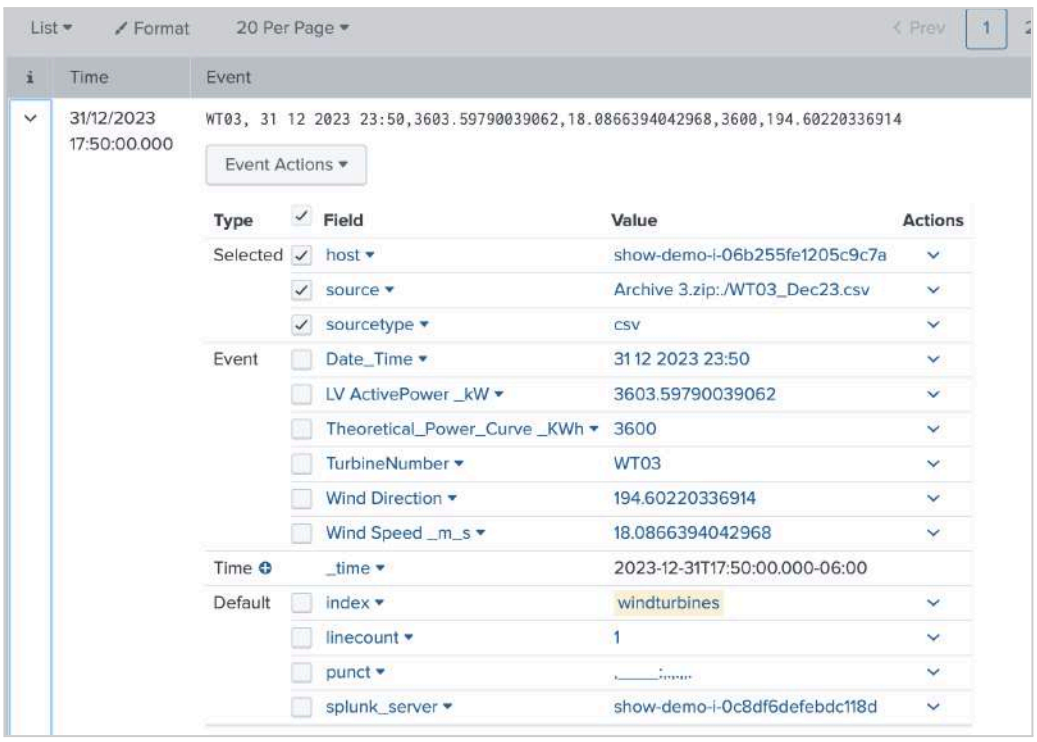
The wind turbine data has already been loaded into an index for you, named "windturbines". Search for all available data using:

```
index=windturbines
```

As this is historical data, you may need to go back 90 days, or more, depending on your results. You should see approximately 16,000 results



Explore one of the events to explore the fields that comprise the event log. You should be able to note around 5 fields that could make the basis of further exploration.



Q1: Using the "interesting fields" list in the UI, can you determine how many wind turbines there are?

A: _____

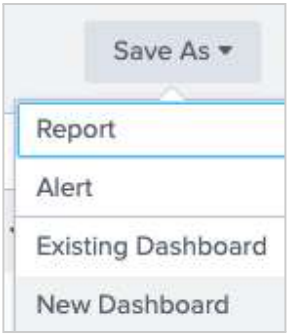
Let's use this as the basis for a new dashboard.

Get a distinct count of number of wind turbines:

```
index=windturbines | stats dc(TurbineNumber)
```

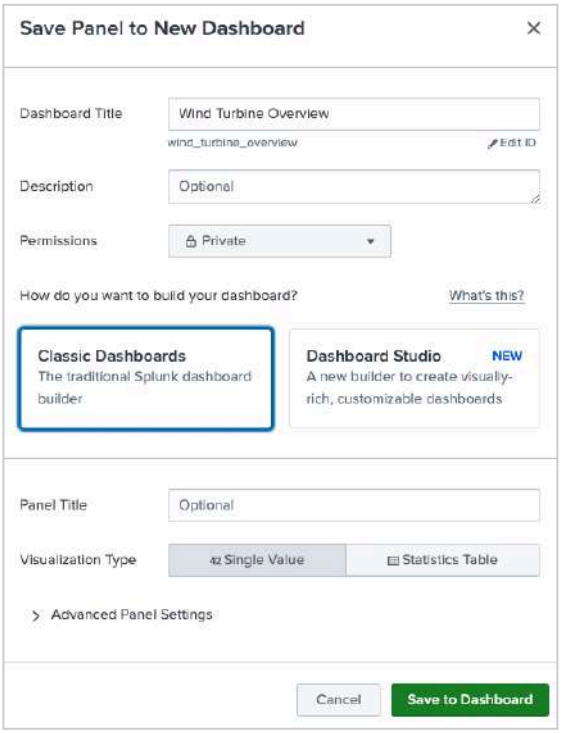
We want this as a **single value** visualisation on our dashboard, so ensure you select that from the choices within **Splunk Visualisations**

Add this to a new dashboard using **Save As** followed by **New Dashboard**, panel name of “Number of Turbines”.



For the dashboard title, we’ll use “**Wind Turbine Overview**” to represent what we are building out.

We'll use ***Classic*** (rather than ***Dashboard Studio***) to build this further. Then **Save to Dashboard**.



And view the new dashboard

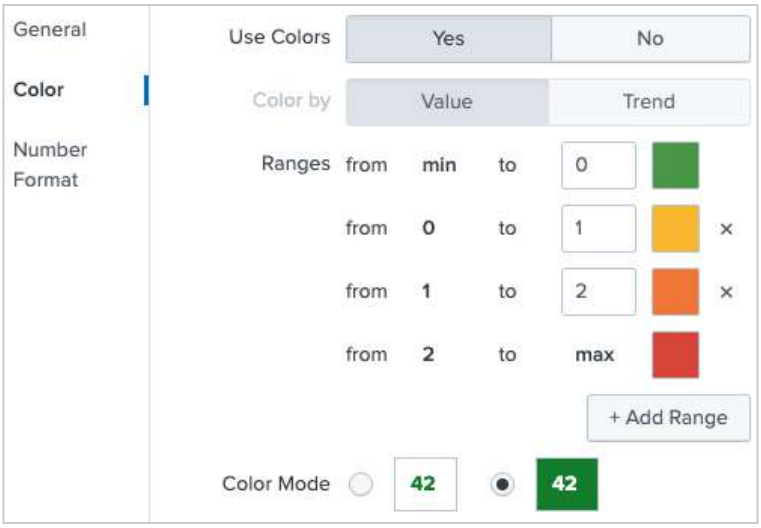
One of the metrics we can leverage is called ***status***. This is an indication of whether a device reports as being online or offline. In this step, we visualise if any devices are currently offline, and also report on how many devices reported as being offline in the last year.

Run a new search using over the last 15 minutes:

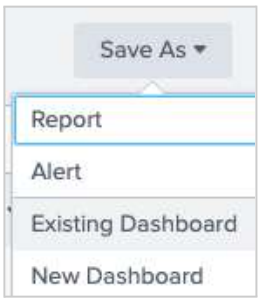
```
index=windturbines status=offline | stats count
```

Ensure this is also a single value visualisation

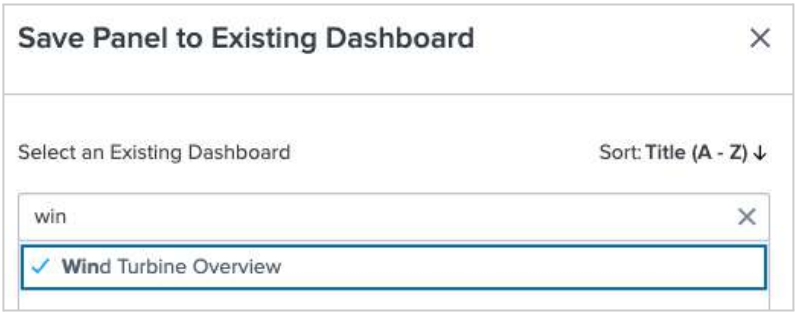
We want to use colour formatting to make it clear if and when this value exceeds our acceptable thresholds



As we already have a dashboard created from the previous step, we'll add this to it.



Name the panel "Current Offline Devices".



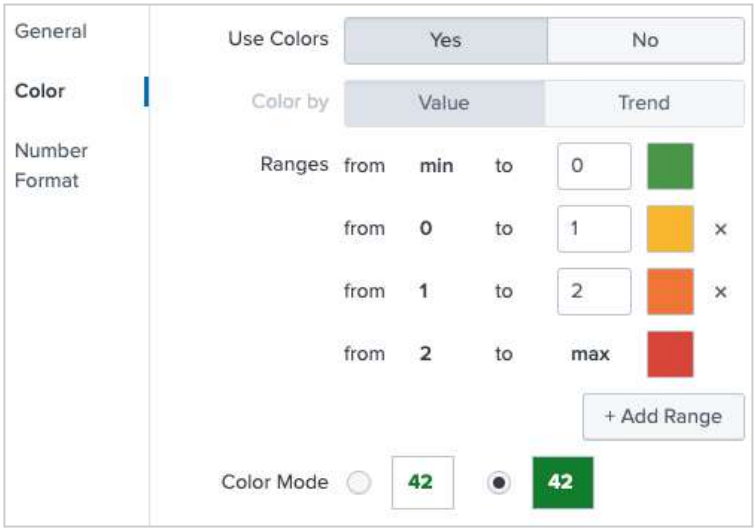
Ensure you **Save**, and then **View**.

Your dashboard should look something like this:

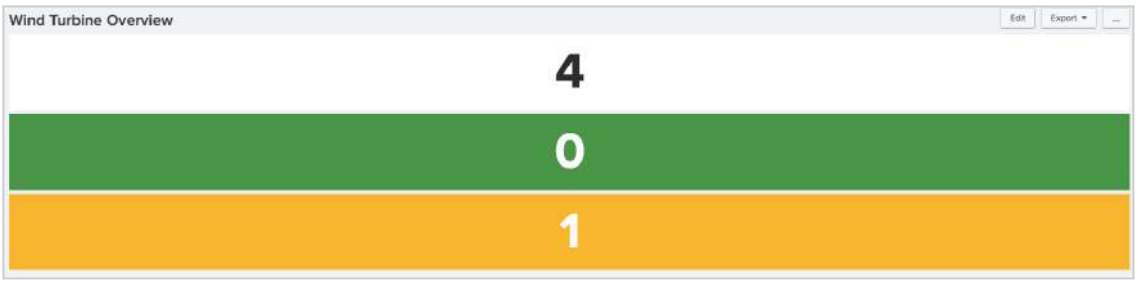
We'll add another metric to indicate how many turbines reported as being offline over last year. Run a new search, over a time range of "last year" in the time picker.

```
index=windturbines status=offline | stats count
```

Format this as a single value, using the colour formatting below



Save to the existing dashboard, and view. Name the panel “Total Offline Devices (1 year)”



We’d like to make better use of space here (as we’ll be adding more items shortly) so we would like these values to appear in one row. Select **Edit** from the dashboard menu.

Using the “drag lines” shown below, move two of the panels alongside each other, in a row.

Now that we know a device was offline at some point, we realise we’d like to have a chart showing when that event happened, as it might happen again.

Return to the search interface and run a search using the *status* field, and using the *timechart* command, over a 90 day period

```
index=windturbines status=offline | timechart count by TurbineNumber
```

Save this as a line chart visualisation to your existing dashboard. Edit the dashboard so it aligns to the other 3 metrics. Use a panel title of “Offline Devices by Time, Turbine Number”

Q2: On what date did a turbine report being offline? Which turbine?

A:_____

It looks like Wind Speed could be an interesting metric to explore further. Create a new visualisation that shows the maximum wind speed over time, for each of the turbines.

Note: as our sample data is limited to December 2023, we will use the commands ***earliest*** and ***latest*** to narrow down to that specific time period in our search (we could also do this via the time range picker in the GUI)

```
index=windturbines earliest="11/26/2023:00:00:00" latest="12/31/2023:20:00:00"
| timechart max("Wind Speed _m_s") by TurbineNumber
```

Save this as a line chart to your existing dashboard.

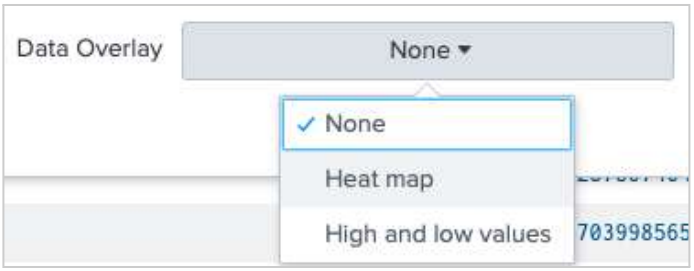
Because it's possible for IoT devices to stop reporting data (if they went "offline" for example), ensure that you use the appropriate formatting of the chart to capture this, by enabling "null values"

Name the panel "Max Wind Speed"

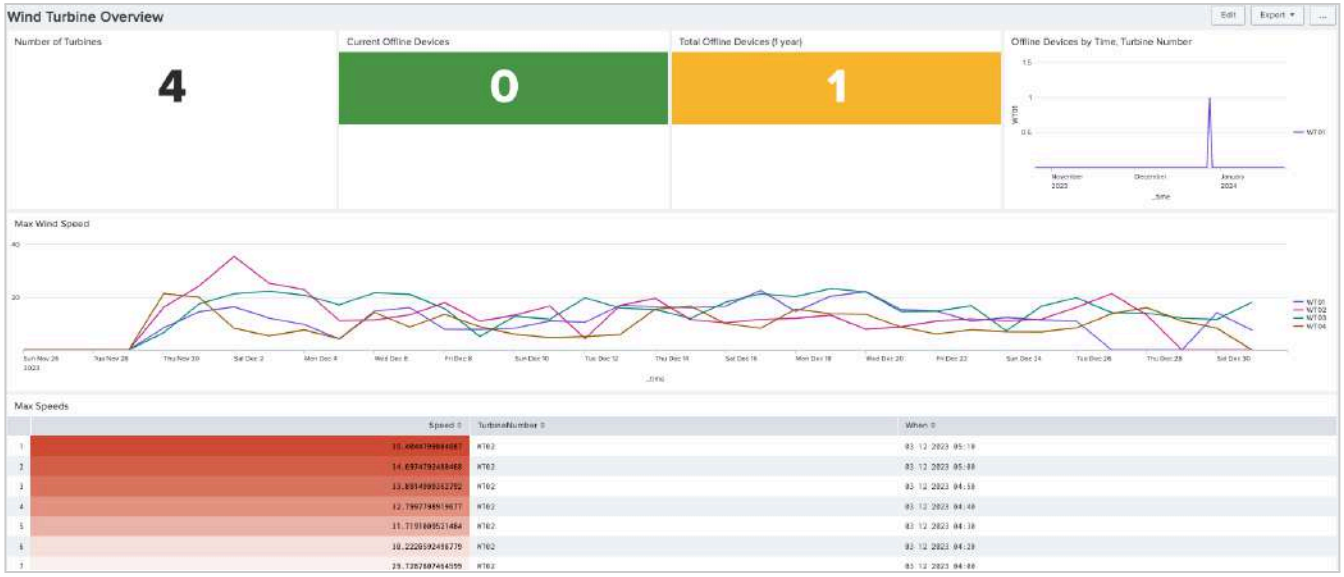
We can visually see where the peaks and troughs were for the wind speed metric, but let's confirm the top values by using a statistics table. We'll also rename fields for convenience of reporting, and sort speed from fastest to slowest.
Run a new search:

```
index=windturbines | table "Wind Speed _m_s", TurbineNumber, Date_Time
| rename Date_Time AS When, "Wind Speed _m_s" AS Speed | sort - Speed
```

Format the table using a **heat map** data overlay, and then save to dashboard.



Your dashboard should now look similar to below



Q3: Which wind turbine produced the greatest speed? What was the speed and when did it happen?

A: _____

We now have a good picture of wind speeds over time, maximum values, and also a view in status (online / offline). Let's correlate what we see…

Q4: What was significant about the speed of WT01 on Dec 27th/28th? How does it relate to the view of offline devices over time?

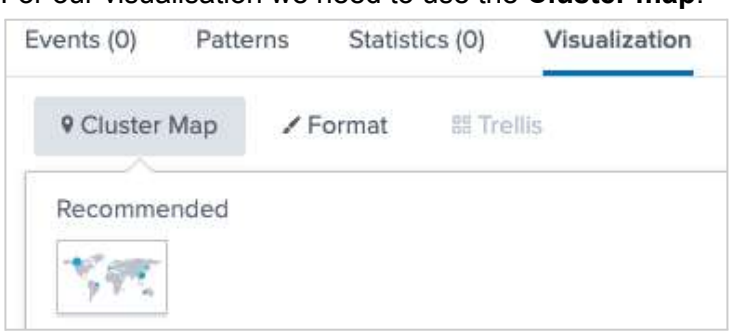
A: _____

Sometimes in manufacturing and IIoT, we might value seeing the location of devices, or where certain events are happening. We can use the longitude and latitude data in our wind turbine data to plot some information to a map.

Run a new search

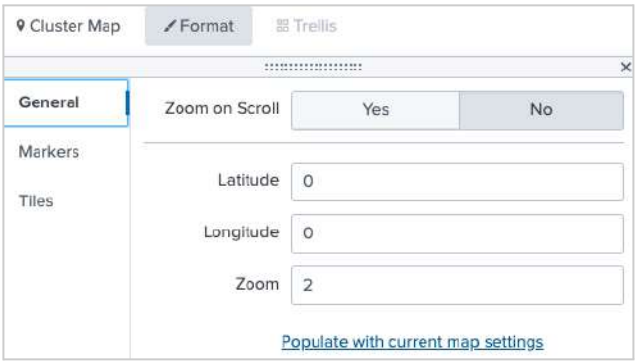
```
index=windturbines long=* lat=*
| geostats latfield=lat longfield=long count by TurbineNumber
```

For our visualisation we need to use the **Cluster map**.



Experiment with zooming into the data (pie charts) and moving the map around so you have a good view of the specific wind turbines.

Once you are happy with the view, you can save these settings for when the map is added to the dashboard. Click **populate with current map settings**.



Save to your dashboard and view your finished work!

Q5: What Countries are the turbines located in or near?

A: _____

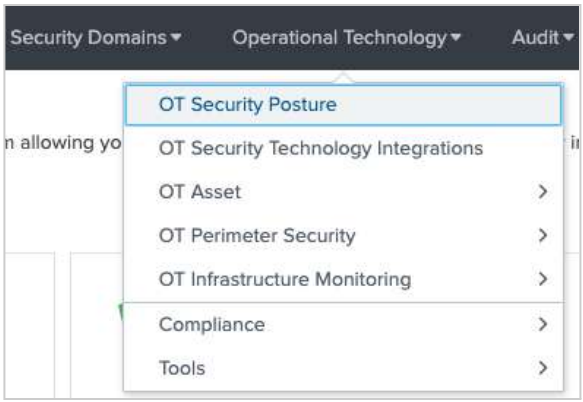
Exercise 6 - Operational Technology: Security

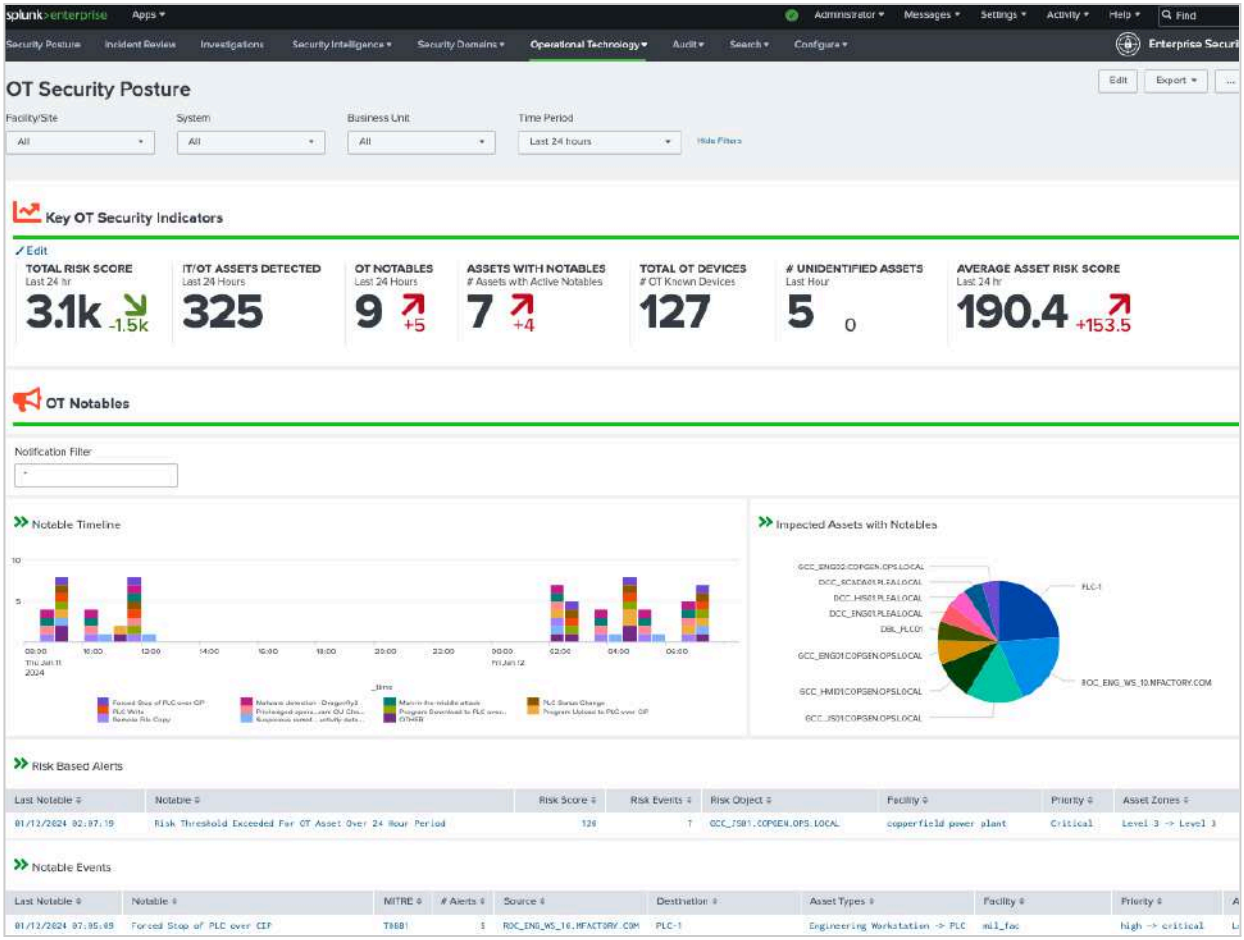
Description

In this Exercise, you will explore the consolidation of OT data into an existing security view so that a single security team can have complete visibility of all areas of the business, encompassing both traditional IT and also OT.

Steps

Navigating the OT Security Add-on

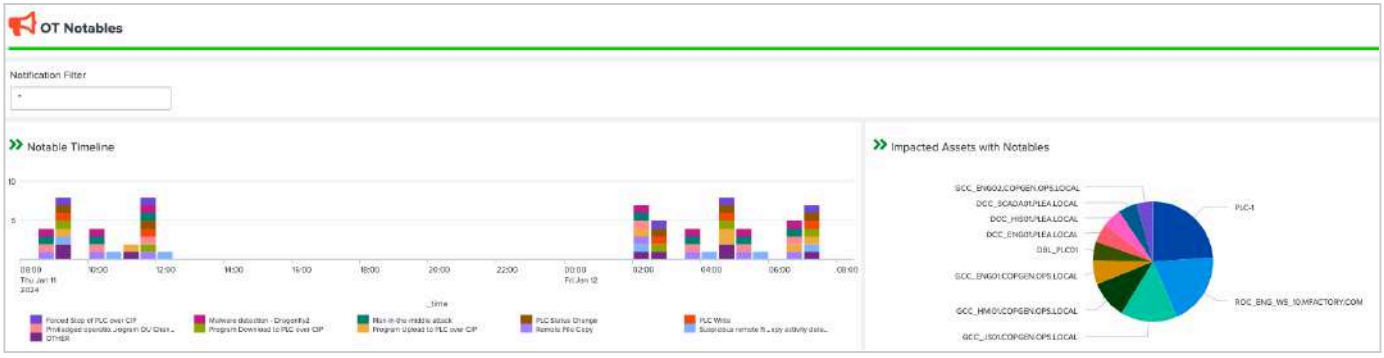




The purpose of this dashboard is to provide a high-level overview of your OT environment. This dashboard is specific only to assets and users that are part of the OT Environment.

Note the filters at the top that allow you to filter down the content at site, system or business unit level. These are completely configurable and allows security teams that may be assigned different responsibilities to find their specific content quickly.

We also provide some Key Security Indicators. These KSIs can be customised, and users can choose to add, remove or create their own, relevant to their needs.



Also provided are insights into Notable Events (Notables), which are our security alerts for the OT environment. We can see how these notables occur over time, as well as the assets that are being impacted.

Notable Events

Last Notable	Notable	MITRE	# Alerts	Source	Destination	Asset Types	Facility	Priority	Asset Zone
01/12/2024 07:05:09	Forced Stop of PLC over CIP	T0881	5	ROC_ENG_WS_10.MFACTORY.COM	PLC-1	Engineering Workstation -> PLC	nil_fac	high -> critical	Level 2 -> Level 1
01/12/2024 07:05:09	PLC Status Change	T0816	5	ROC_ENG_WS_10.MFACTORY.COM	PLC-1	Engineering Workstation -> PLC	nil_fac	high -> critical	Level 2 -> Level 1
01/12/2024 07:05:09	PLC Write	T0855	5	ROC_ENG_WS_10.MFACTORY.COM	PLC-1	Engineering Workstation -> PLC	nil_fac	high -> critical	Level 2 -> Level 1
01/12/2024 07:05:09	Program Download to PLC over CIP	T0845	5	ROC_ENG_WS_10.MFACTORY.COM	PLC-1	Engineering Workstation -> PLC	nil_fac	high -> critical	Level 2 -> Level 1
01/12/2024 07:05:09	Program Upload to PLC over CIP	T0800	2	ROC_ENG_WS_10.MFACTORY.COM	PLC-1	Engineering Workstation -> PLC	nil_fac	high -> critical	Level 2 -> Level 1
01/12/2024 07:00:34	Suspicious remote file copy activity detected	T0867	7	GCC_JS01.COPGEN.OPS.LOCAL	GCC_HMI01.COPGEN.OPS.LOCAL	Remote Access -> HMI	copperfield power plant	critical -> high	Level 3 -> Level 3
01/12/2024 06:55:14	Program Upload to PLC over CIP	T0845	21	GCC_ENG02.COPGEN.OPS.LOCAL	PLC-1	Engineering Workstation -> PLC	copperfield power plant	medium -> critical	Level 3 -> Level 1

Finally, we see the specific notables with a lot of enriched details. These are important because they add valuable context for handling these security alerts.

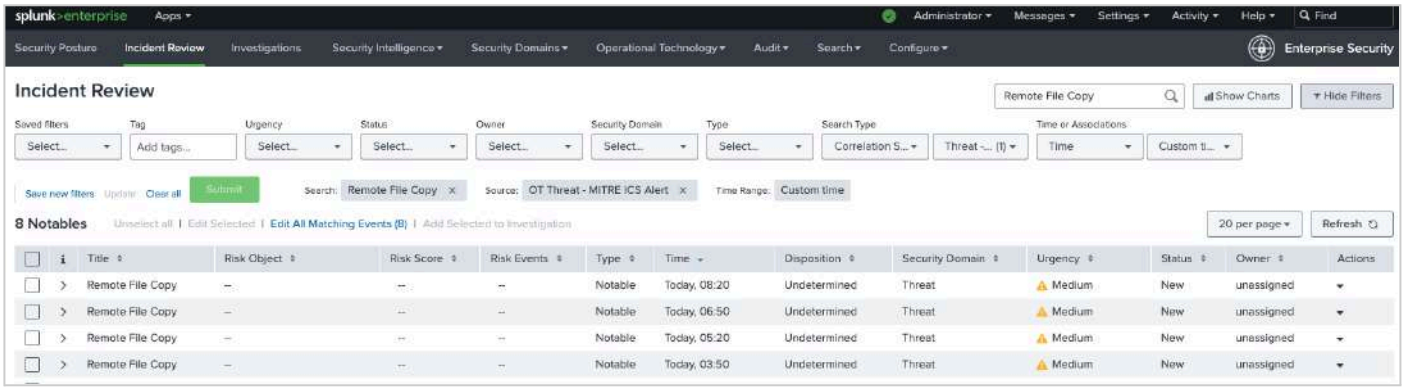
In this example, we can see the nature of the threat (Remote File Copy), how it relates to MITRE ATT&CK models (T0867 - Lateral Tool Transfer), and the asset type (Human Machine Interface)

Last Notable	Notable	MITRE	# Alerts	Source	Destination	Asset Types	Facility	Priority
01/12/2024 08:20:17	Remote File Copy	T0867	8	GCC_JS01.COPGEN.OPS.LOCAL	GCC_HMI01.COPGEN.OPS.LOCAL	Remote Access -> HMI	copperfield power plant	critical -> high

Note, the OT Security Add-on also maps onto MITRE ICS ATT&CK model.

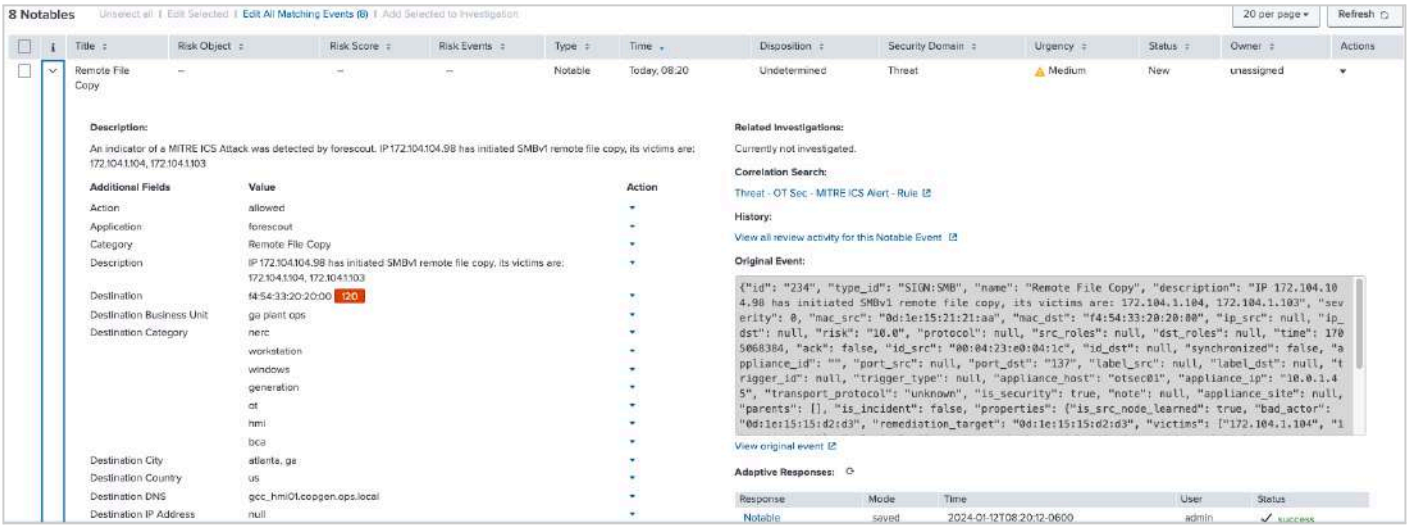
Exploring a Notable

Drill-down into the “Remote File Copy” notable by clicking on any of the hyperlinks in that row.

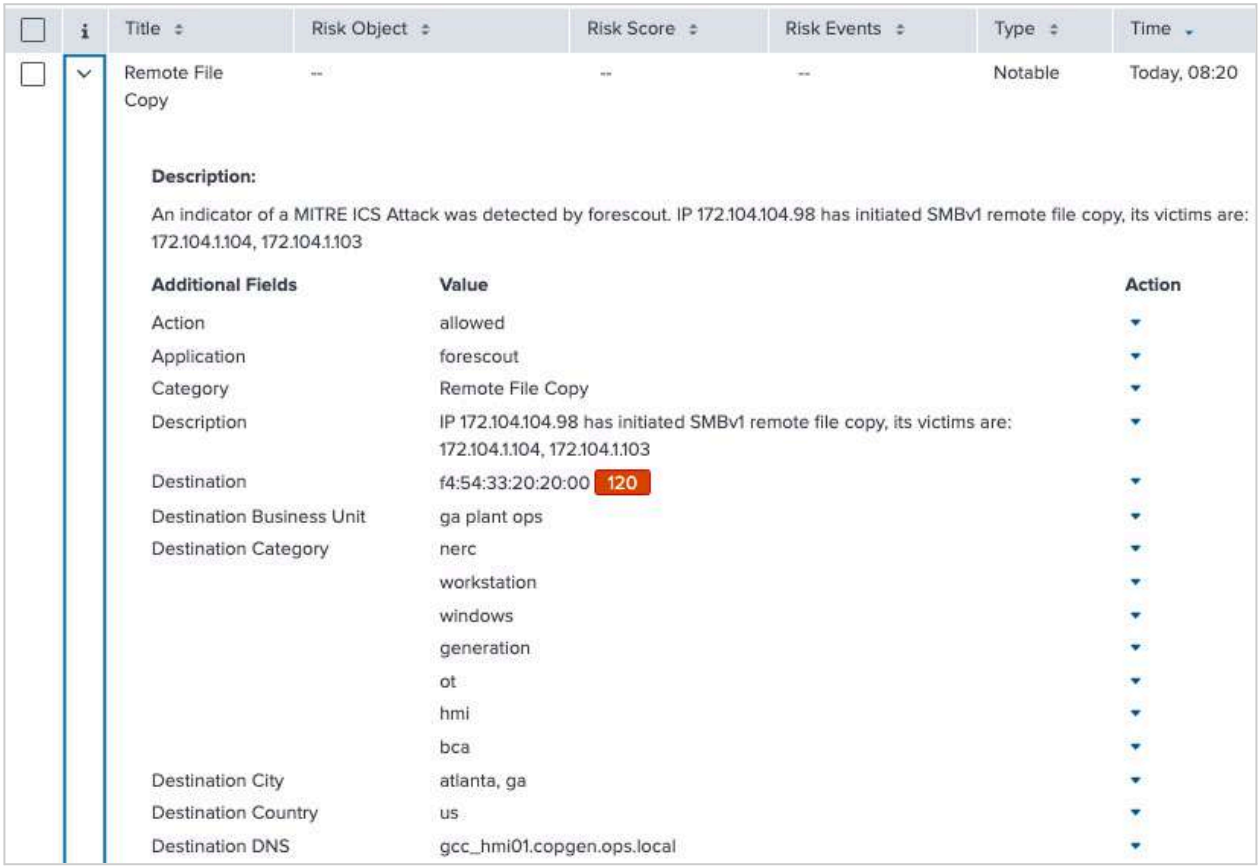


Note how we are now leveraging the Incident Review capability within Splunk Enterprise Security, to give a holistic “SOC” experience (IT & OT consolidation).

We can see all the incidents that matched our notable from the OT Security Overview dashboard. Expand the incident to get more information as well as the assets and users involved.
Expand any of the notables by clicking on the “>” icon



We can see the description of the alert, and more information about why it was flagged.



We see a categorisation of the asset (various), what type of machine it is. Looking at the source, we can see the mac address that was part of the alert, and its corresponding risk score.

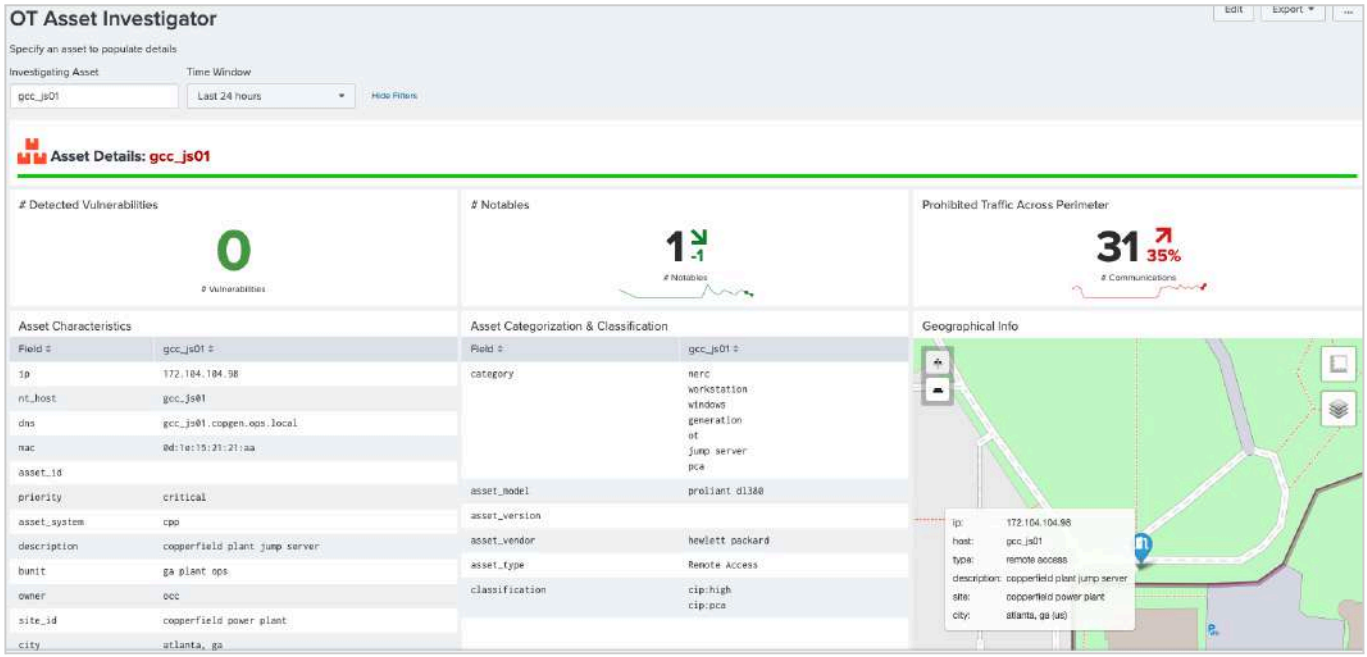
Session Identifier	null
Severity	unknown
Signature	Remote File Copy
Source	0d:1e:15:21:21:aa 240
Source Business Unit	ga plant ops
Source Category	nerc
	workstation

The mac address may not always be helpful to an analyst, but we see also the IP address and hostname, which may be more meaningful. We can learn more about this asset by selecting “OT Asset Investigator” from the action menu (down arrow symbol).

	generation
	ot
	jump server
	pca
Source City	atlanta, ga
Source Country	us
Source DNS	gcc_js01.copgen.ops.local
Source IP Address	172.104.104.98
Source Expected	true
Source Latitude	33.734375
Source Longitude	-84.372268
Source MAC Address	0d:1e:15:21:21:aa
Source NT Hostname	gcc_js01

- Intrusion Search (as destination)
- Intrusion Search (as source)
- Notable Event Search
- Malware Search
- Nbtstat gcc_js01
- Nslookup gcc_js01
- OT Asset Investigator
- OT Host Access Monitoring
- Ping gcc_js01

The OT Asset Investigator is designed to help us understand assets and their behaviours.

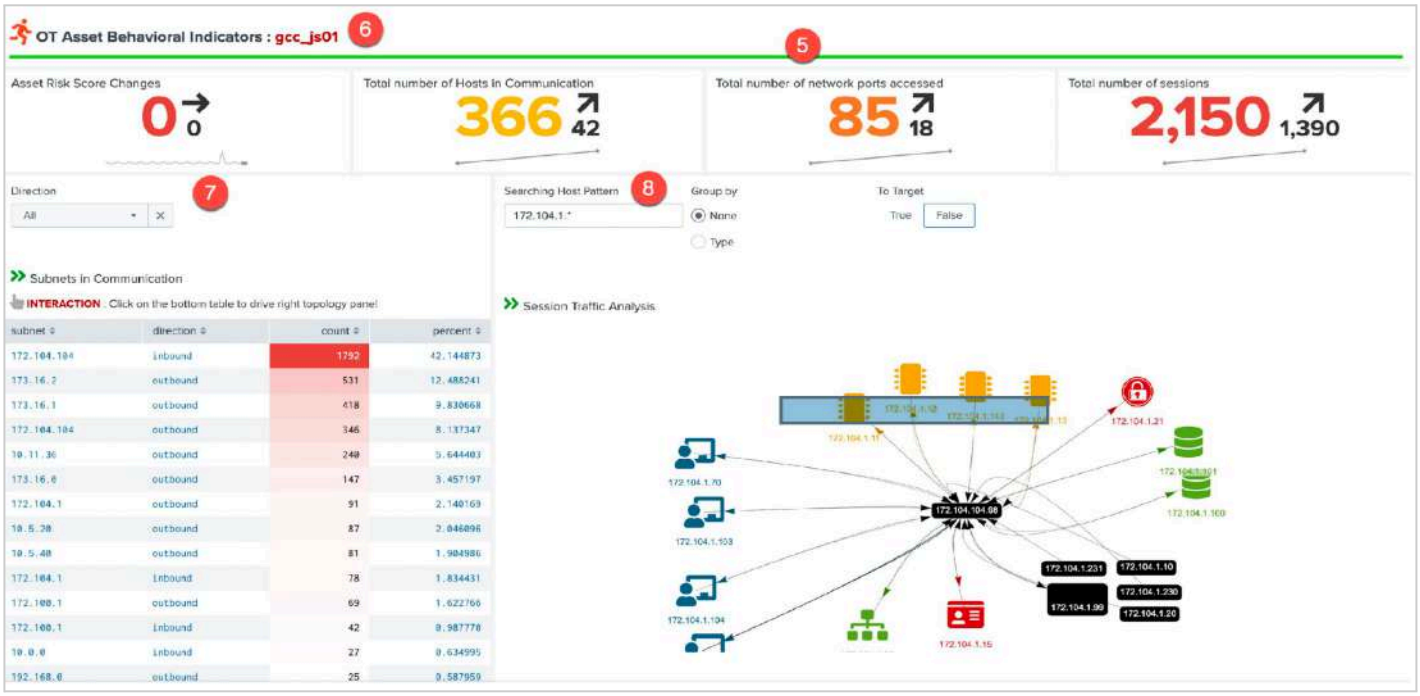


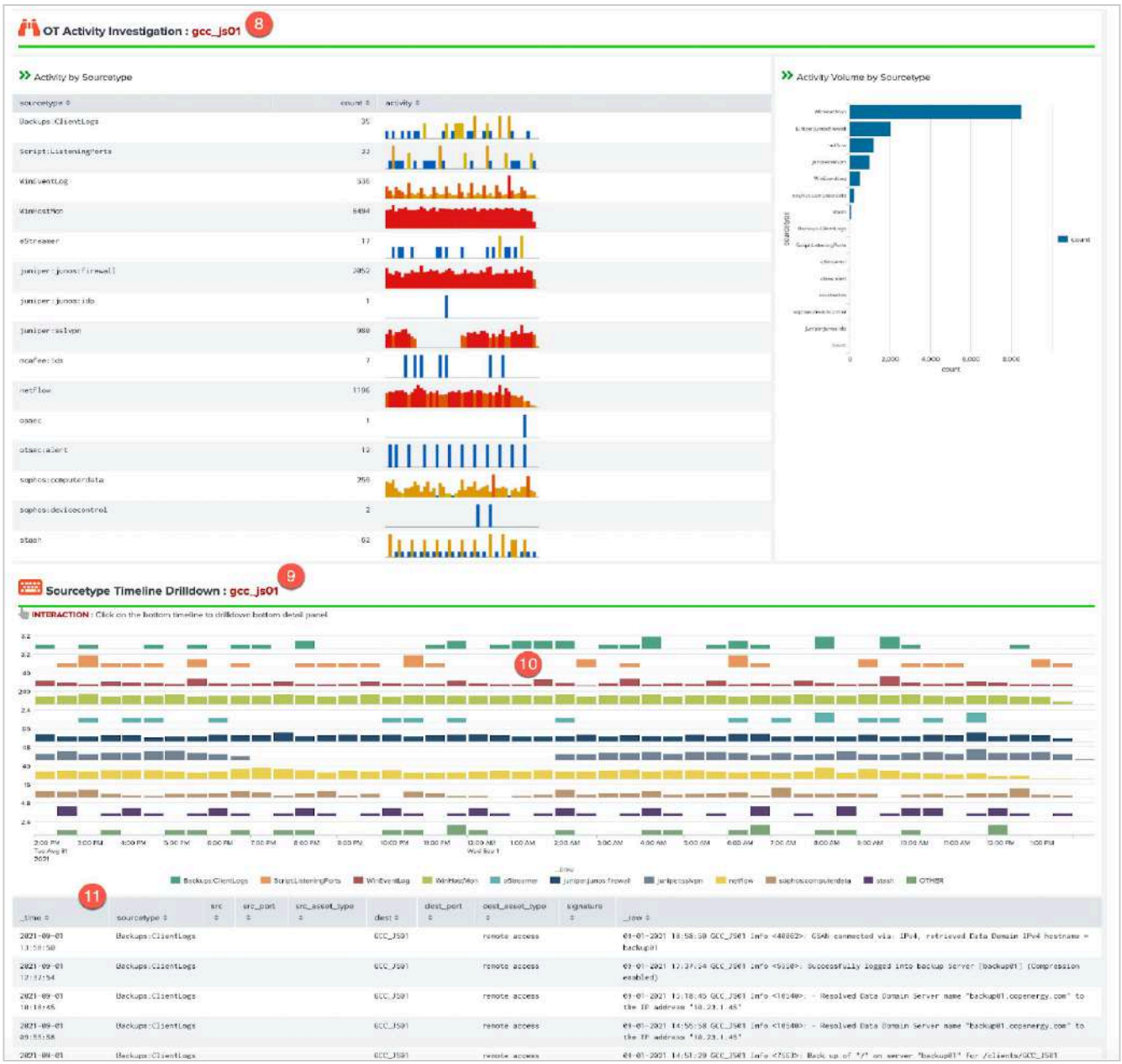
Here we are looking at the asset “gcc_js01”.
This view provides information about the asset such as IP address, mac address, but also site, description and location.

Q: What is the location of this asset? A: _____

Additionally, we see categories, security classifications, and the physical location of the asset on a map.

Q: Where does the asset seem to be located? A: _____




OT Activity Investigation : gcc_js01
8
Activity by Sourcetype
Activity Volume by Sourcetype
Sourcetype Timeline Drilldown : gcc_js01
9
10
11

Exercise 7 - Business Service Insights: exploring capability

Description

Service Insights in IT Service Intelligence (ITSI) represents the mapping and monitoring of business and technical services within your organisation. The information derived from Service Insights helps you better detect problems, simplify investigations, triage issues, and accelerate resolutions.

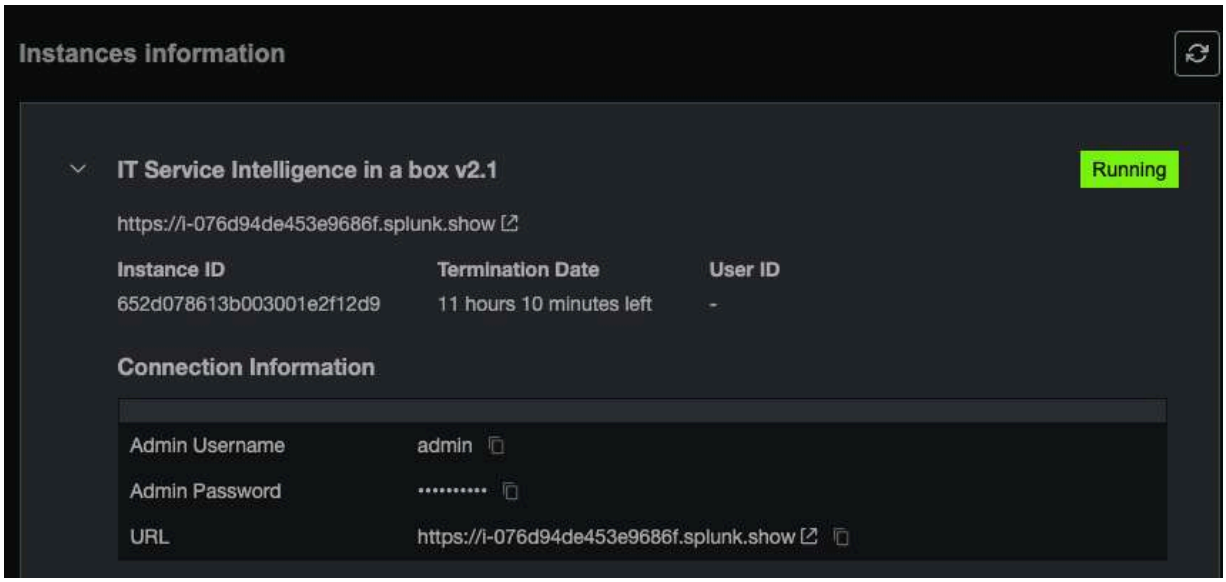
Within ITSI, a service is a set of interconnected applications and hosts that are configured to offer a specific service to the organisation. Services can be internal, like an organisation email system, or customer-facing, like an organisation's website. For example, creating financial reports through a web-based application requires a computer, web server, application server, databases, middleware, and network infrastructure. These applications and hosts are all configured to offer the service of financial reporting.

For the next few steps, we will be using an example service from the Financial Services Industry (to show that any organisation can make use of service monitoring). We will then switch back to some manufacturing use cases.

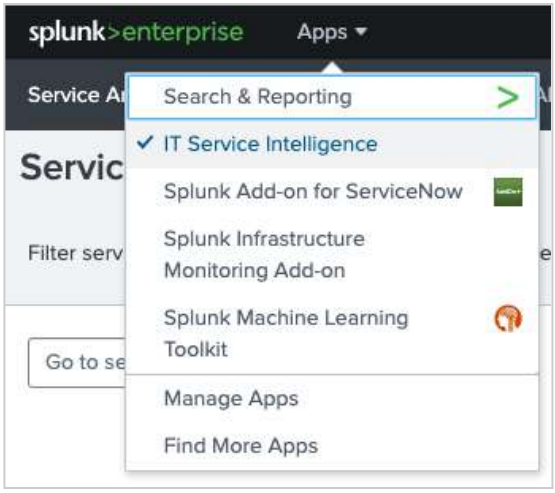
Steps

Switching lab environment

For the remainder of the labs, you will using the “IT Service Intelligence in box” instance



Navigate to the “IT Service Intelligence” app, if not already taken there after logging in

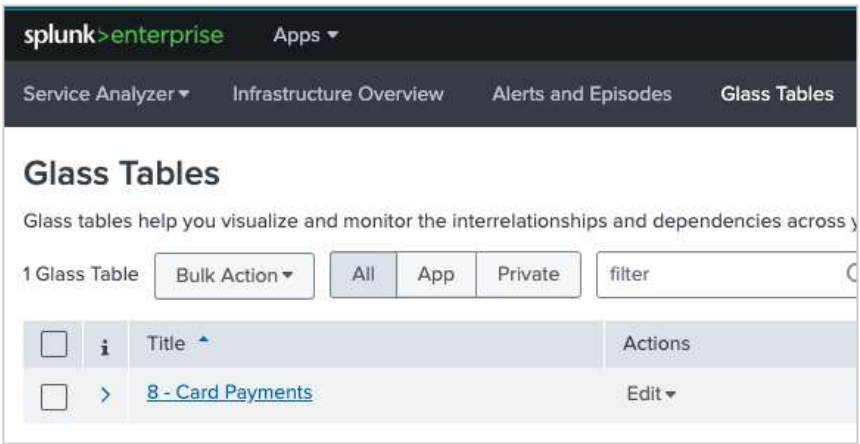


Exploring a Glass Table view

Glass tables allow users to visualise and monitor the interrelationships and dependencies across your IT and business services. You can use glass tables to create dynamic contextual views of your IT topology or business processes and monitor them in real time. You can add metrics like KPIs, ad hoc searches, and service health scores that update in real time against a background that you design. Glass tables show real-time data generated by KPIs and services.

Let's explore an example Glass Table that was built to represent a "Card Payments" process that mirrors what a commercial/retail bank may need to monitor.

Locate the "Card Payments" Glass Table by selecting the **Glass Tables** tab from the ITSI main menu



Select the hyperlink "8 - Card Payments" to view the Glass Table

Note that there are several other example Glass Tables which you are free to explore throughout today

Expand the Glass Table by selecting the **Fullscreen** icon:

Please review the following questions to help identify what we can learn about the information presented to the user. Remember that Glass Tables are completely customisable for all types of audience, so this a demonstration of the “art of the possible” - you are only limited by your imagination!

Q1: Service Health - which of the 4 services has the lowest/worst health score?

A: _____

Q2: KPIs - how many Fraud alerts have occurred in the last hour?

A: _____

Q3: What’s the main reason that Confirmation has a low score?

A: _____

Q4: What technical components are involved in this degradation? (HINT: Use the lowest layer of the diagram to find this)

A: _____

Exploring a Service Analyzer

The Service Analyzer is the home page for Splunk IT Service Intelligence (ITSI) and serves as your starting point for monitoring your IT operations. The Service Analyzer enables you to see the health of your IT environment at a glance.

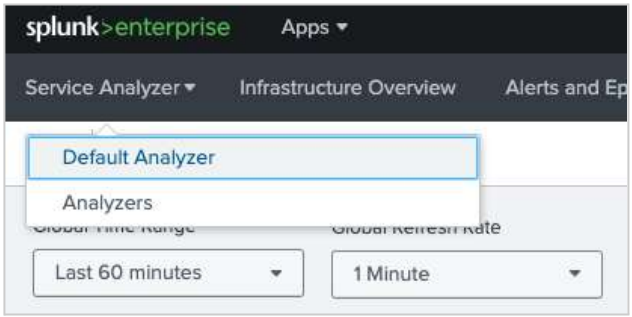
The Service Analyzer provides an overview of ITSI service health scores and KPI search results that are currently trending at the highest severity levels. Use the Service Analyzer to quickly view the status of IT

operations and to identify services and KPIs running outside expected norms. Click on any tile in the Service Analyzer to drill down to the deep dives for further analysis and comparison of search results over time.

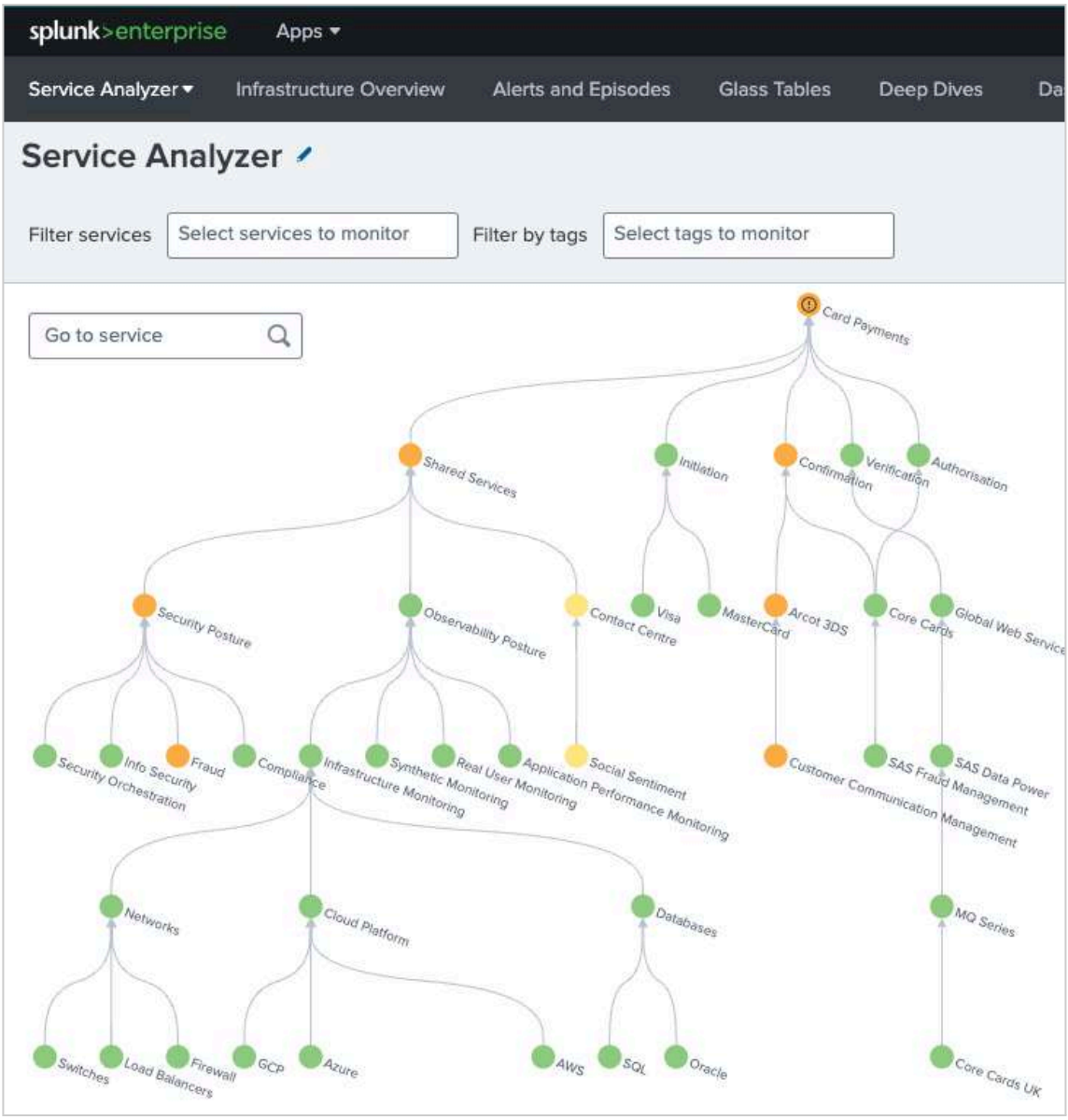
There are two service analyzer views: the tile view and the tree view. You can drill down to more detailed information from each view to investigate services with poor health scores.

To access the Service Analyzer, click **Service Analyzer > Default Service Analyzer** from the ITSI main menu. The tile view is the default view, but whichever view you last saved loads the next time you open the Service Analyzer.

Navigate to the Default Analyzer via **Service Analyzer** tab:



You should see a service tree diagram similar to below. If you cannot see the whole tree, use the **center** icon and the **zoom in / zoom out** controls to fit everything into your screen. Also use your mouse to zoom in and out:



Please review the following questions to learn how the Service Analyzer can be used to determine likely root causes of issues

Q5: There are actually a number of services impacting Card Payments - name 2 of them. HINT: focus on the root cause.

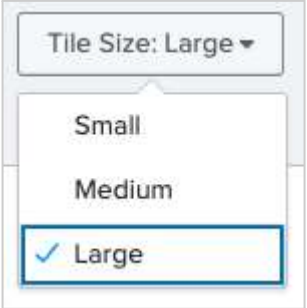
Locate the KPIs for the Card Payment service by selecting the icon below

Q6: How many KPIs are there and what are their severities?

Experiment toggling between Hierarchy view and Tile view:

In the Tile view, use the cog icon, reduce the number of services that appear in the tile view

and experiment with different tile sizes



Exploring Deep Dive view

Deep dives are an investigative tool to help you identify and troubleshoot issues in your IT environment in IT Service Intelligence (ITSI). Use deep dives to view KPI search results over time, zoom-in on KPI search results, and visually correlate root cause. Stack and organise deep dive lanes to create contextual views of metrics across your services.

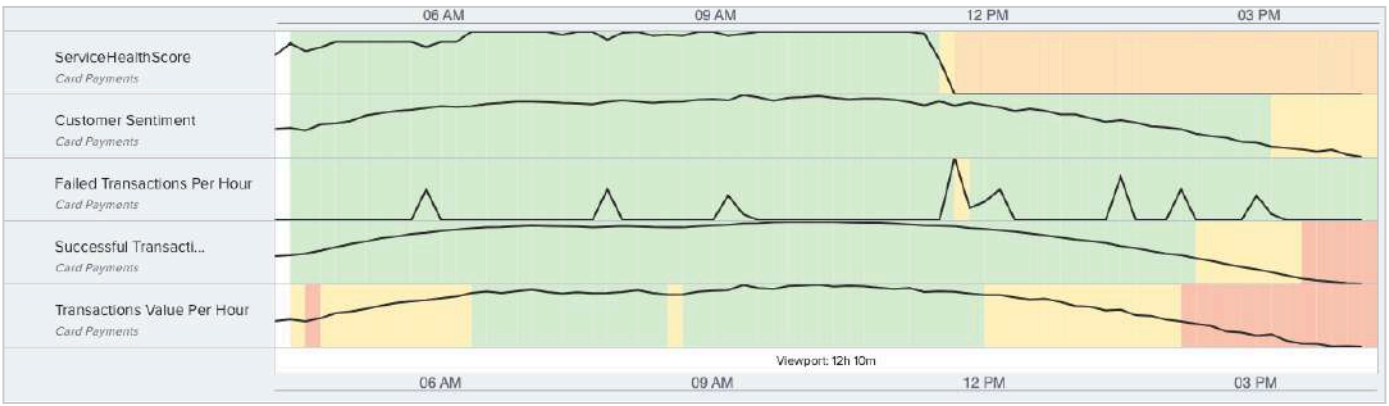
You can use deep dives to quickly zoom in on metric and log events, and visually correlate root cause. You can create swim lanes for both KPI and ad hoc searches, and you can customise the look of your swimlanes with unique graph types and colours to differentiate services and metrics.

We need to pivot into an investigative view of what's going using a view called **Deep Dive**.

In the Tree view of **Service Analyzer,** access **Deep Dive** via the Card Payment service. Ensure Card Payment icon has been selected.

Then select **Open all in Deep Dive** link

Here we see the RAG value of KPIs over any given time range, and we can see their relationship to each other.

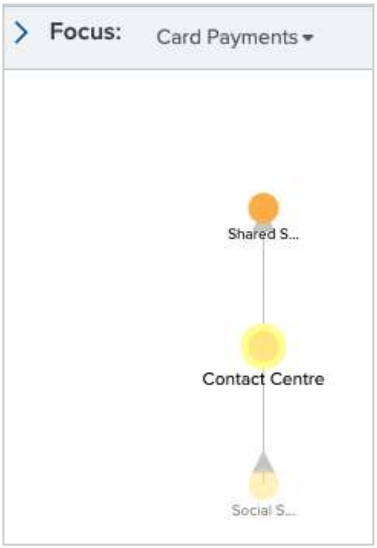


As this is Splunk, we have full control over the time range of the data displayed. Experiment with different settings e.g. 15 mins, 60 mins etc.

Although we are looking at the KPIs for the **Card Payment** service, we can pull in any business or technical KPIs from any other service. Let's add a KPI from the **Social Sentiment** service.

In the Focus view to the right of the swim-lane view, view the Contact Centre KPIs under

Card Payments > Shared Services > Contact Centre



Note the various KPIs available and their individual values (red/amber/green)

Q7: Which KPIs look particularly problematic?

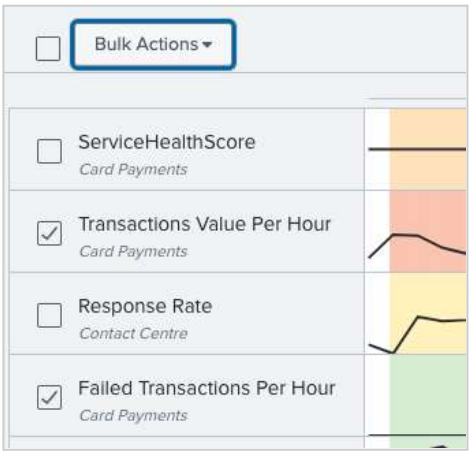
Add it into the deep dive view (if none stand out, pick one that is red / amber)

As this is a timeline view (from left to right), it would be good to be able to reorder these swimlanes, or lessen the focus on the KPIs that aren't impacting service performance. Experiment with moving the swimlanes around using the "drag" icon. You'll need to mouse over each swimlane name to see this.

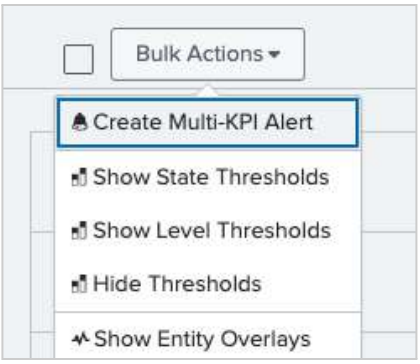
Create a multi-KPI alert

Rather than being alerted when individual thresholds are breached, we want to create a "multi-KPI alert" - something where we will only be alerted if a number of thresholds are breached, using a determination of our own choosing.

Select a couple of KPIs



And then select the Bulk Action button to navigate to the alert config screen



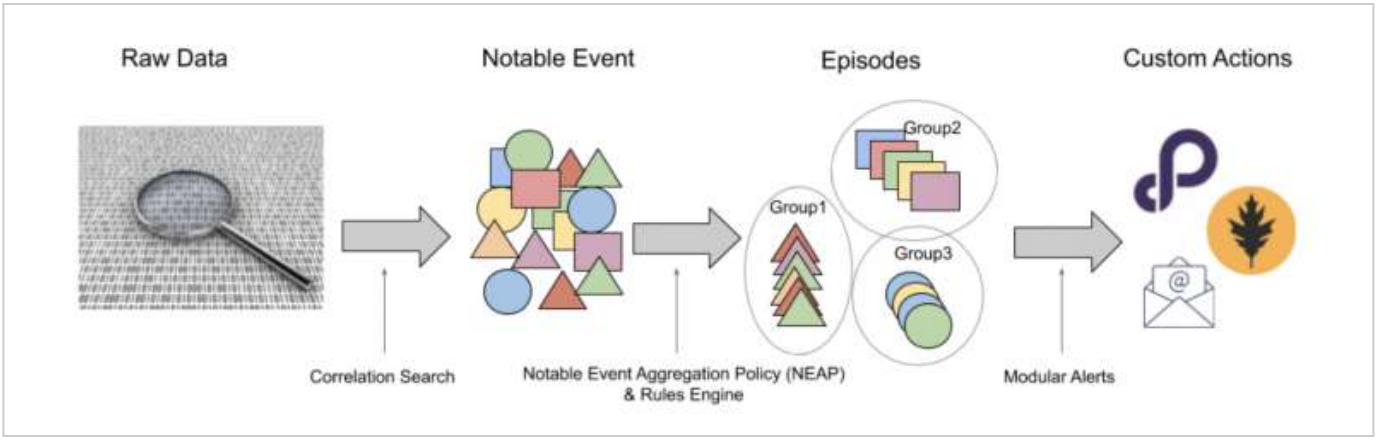
No need to save changes - there are many configurable options in this screen which we will not cover today, but are covered in our in-depth workshops.

Exploring Alerts & Episodes View

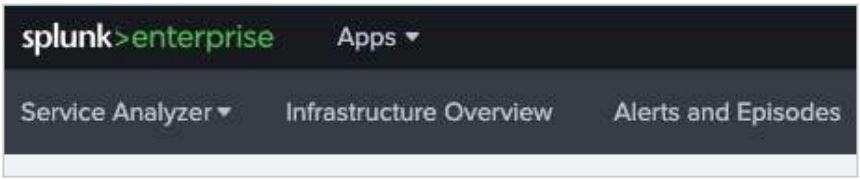
Splunk IT Service Intelligence (ITSI) Event Analytics ingests events from across your IT landscape and from other monitoring silos to provide a unified operational console of all your events and service-impacting issues. You can also integrate with incident management tools and help desk applications to accelerate incident investigation and automate remedial actions.

Event Analytics is equipped to handle huge numbers of events coming into ITSI at once. Because these events might be related to each other, they must be grouped together so you can identify the underlying problem. Event Analytics provides a way to deal with this huge volume and variety of events.

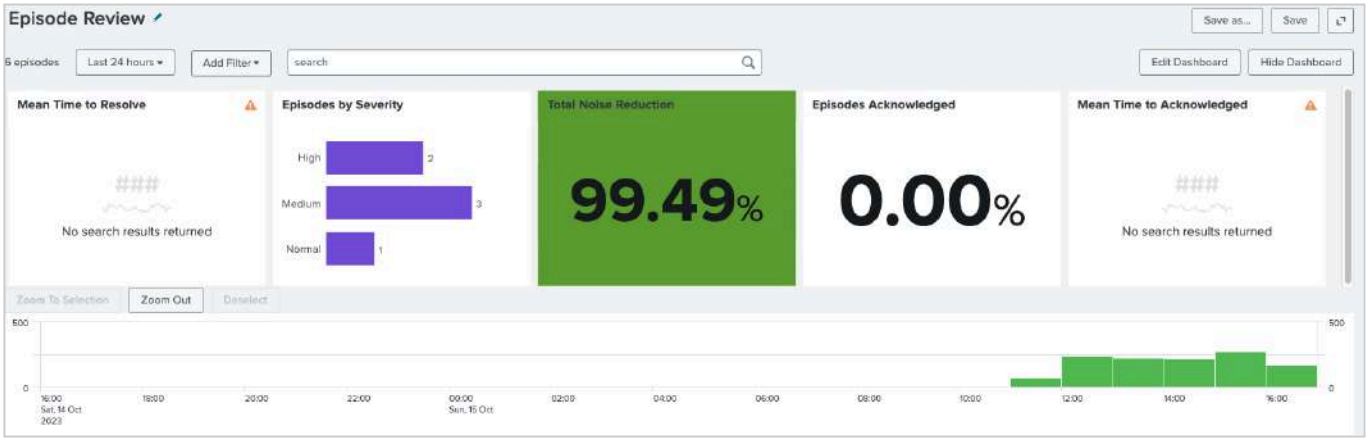
Aggregation policies reduce your event noise by grouping notable events based on their similarity and displaying them in Episode Review. An episode is a collection of notable events grouped together based on a set of predefined rules. An episode represents a group of events occurring as part of a larger sequence, or an incident or period considered in isolation. Aggregation policies let you focus on key event groups and perform actions based on certain trigger conditions, such as consolidating duplicate events, suppressing alerts, or closing episodes when a clearing event is received.



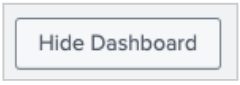
Navigate to the **Alerts and Episode** view via the main menu



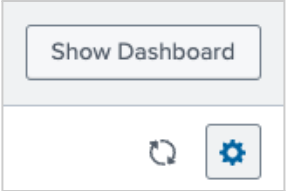
The Episode Review dashboard provides insights in high-level metrics around noise reduced through improved filtering and alerting of events



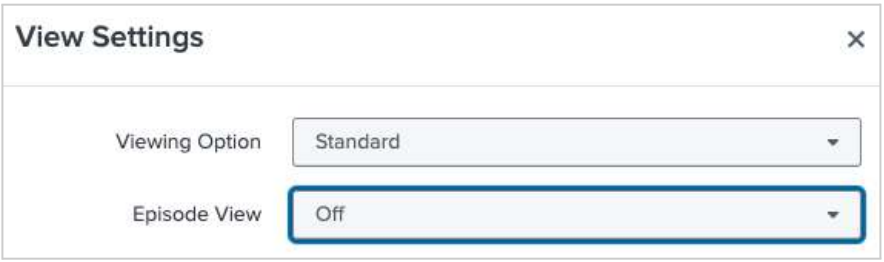
We can hide this for now:

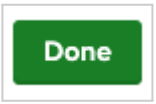


Before proceeding, ensure that **Episode View** is set to **Off** via the configuration cog icon:

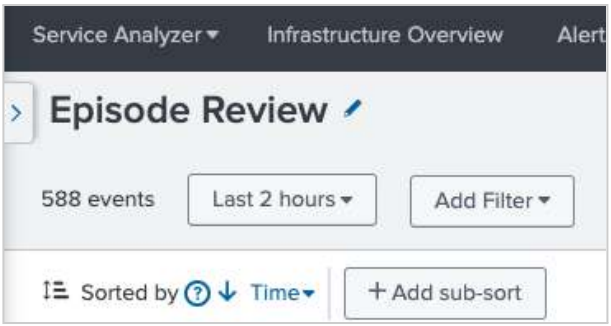


Toggle the “Episode View” setting as necessary, and click **Done**:

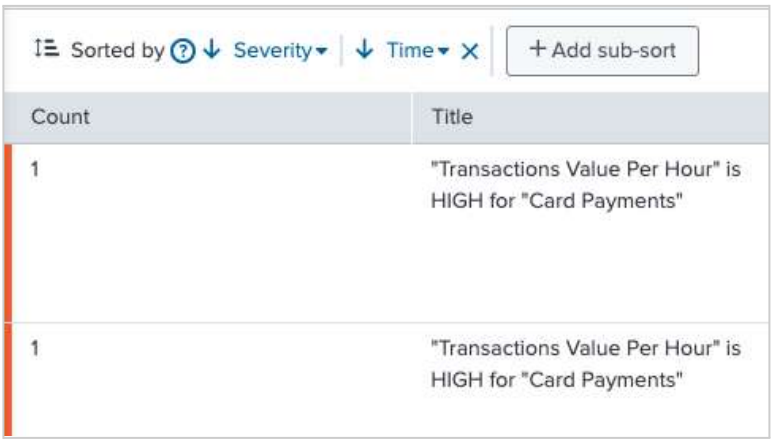




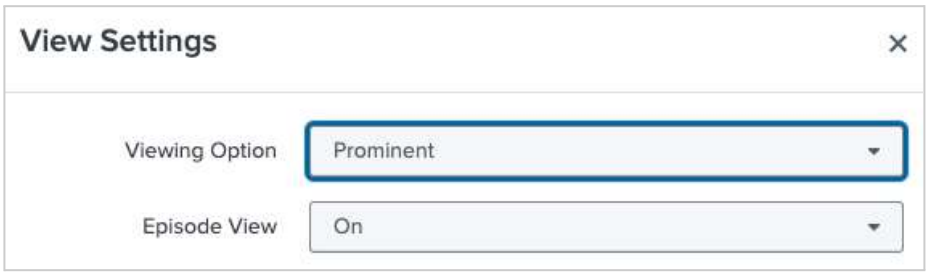
Q8: How many events have occurred in the last 2 hours (your results may differ from screenshot below)?



Note that you can change how events are sorted, and add additional sort settings. Try sorting by **Severity**, and then add a **sub-sort** field.



Now turn on **Episode View** back to **On** and also ensure **Prominent** is selected from **Viewing Option**:



Q9: How many are there now? More or Less? Why do you think that is? Hint: click on one of the episodes for more information.

Congratulations - you have successfully navigated through IT Service Intelligence.

Exercise 8 - Business Service Insights: building out a service view

Description

Now that you have explored some of the key features of ITSI, now is the time for you to start building out a few examples yourself.

Steps

Expand an existing service for Manufacturing

Rather than building out a service completely from scratch, which would mean creating all of the service dependencies by hand, we have created an example for you, based on some possible scenarios in Manufacturing.

Note: Splunk has an ***import from CSV*** feature which means that complex services with many dependencies can be modelled using a pre-defined .csv file template, to save on manual configuration time.

For this lab, we have provided a ***.csv*** file for you to import. Navigate to the Splunk google drive repository for the asset needed for this lab: https://splk.it/Manu-Lab-Assets. Download to your local machine the file "**ITSI_Manu.csv**".

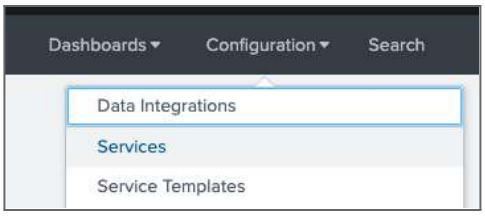
From this file, we are going to create an example manufacturing service tree for our fictional organisation "**Splunk Widget Co.**".

Open/Edit the file and confirm that the file looks similar to below:

	A	B	C
1	**Service**	**Service Description**	**Dependent Services**
2	Splunk Widget Co.		Product Assembly Line, IIoT Monitoring, Order Management, Warehouse Management, Shipping Management, Inventory
3	Product Assembly Line	Sub-service of Splunk Widget Co.	Robots, Misc Infra, Carts, Conveyor Belts
4	Warehouse Management	Sub-service of Splunk Widget Co.	Forklifts
5	IIoT Monitoring	Sub-service of Splunk Widget Co.	Drones, Turbines, Sensors
6	Robots	Sub-services of Product Assembly Line	Welding Robots, Painting Robots, Automated Inspection
7	Misc Infra	Sub-services of Product Assembly Line	ERP/CRM, 3rdPartyAPIs, 5G, WiFi

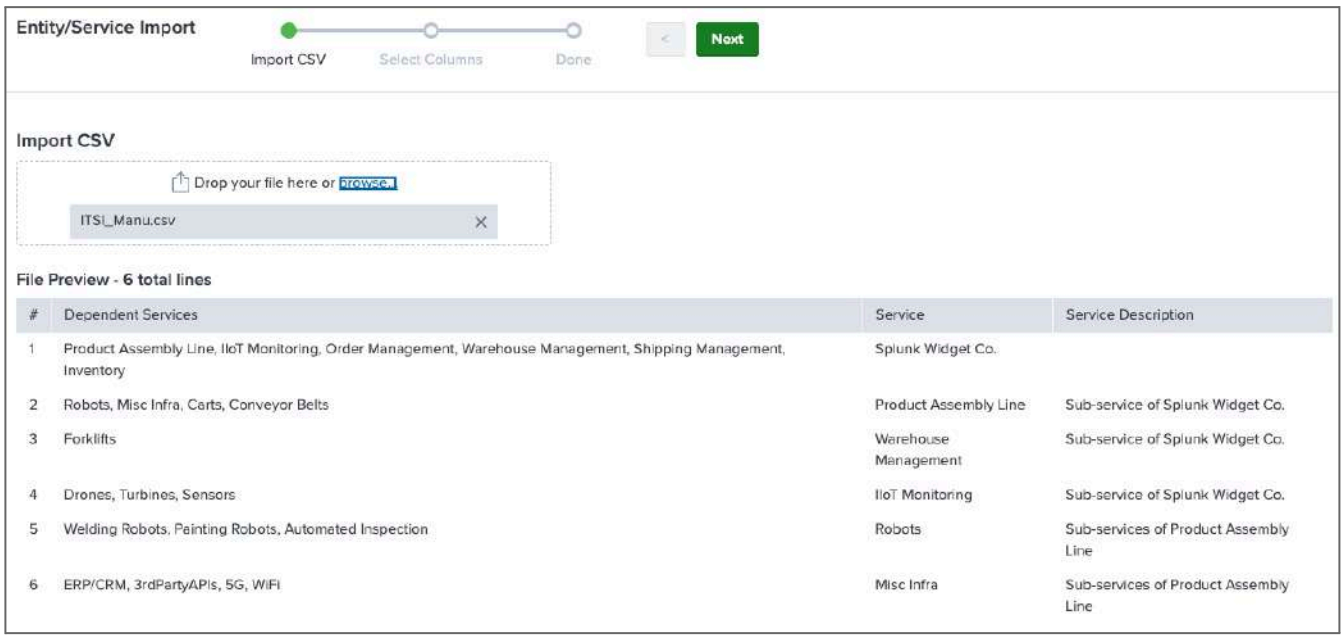
Import the service template

From within ITSI, navigate to the services configuration via **Configuration** tab in main menu, and select **Services**.



From here, create select the **Create Service** drop-down button and choose the **Import from CSV** option:

The UI will ask you to drop a file into the UI, or allow you to browse a file from your local device. Use the **ITSI_Manu.csv** you downloaded in the previous step so that you have something similar to:



Select Next to proceed to configure the import settings

We need to ensure that each column in the .csv file is correctly interpreted, so copy the settings use in the image below:

Specify Columns

Select the columns to import and how they should be converted to ITSI object data type (service or entity). If you are importing entities, you must specify one column as the Entity Title. If you are importing services, you must specify one column as the Service Title.

Column Name	Import Column As	Sample Values From Search
Dependent Services	Dependent Services	Product Assembly Line, IIoT Monitoring, Order Management, Warehouse Management, Shipping Management, Inventory
Service	Service Title	Splunk Widget Co.
Service Description	Service Description	

It is useful to select **Import Service As** “Enabled” as that means that the service will effectively be “live” when we start to add KPIs and Health Scores into the configuration.

Settings

Service Team: Global

Import Services As: Enabled

The preview in the UI should look like this:

Preview

The preview displays your imported entity and service information. It does not show final merged values.

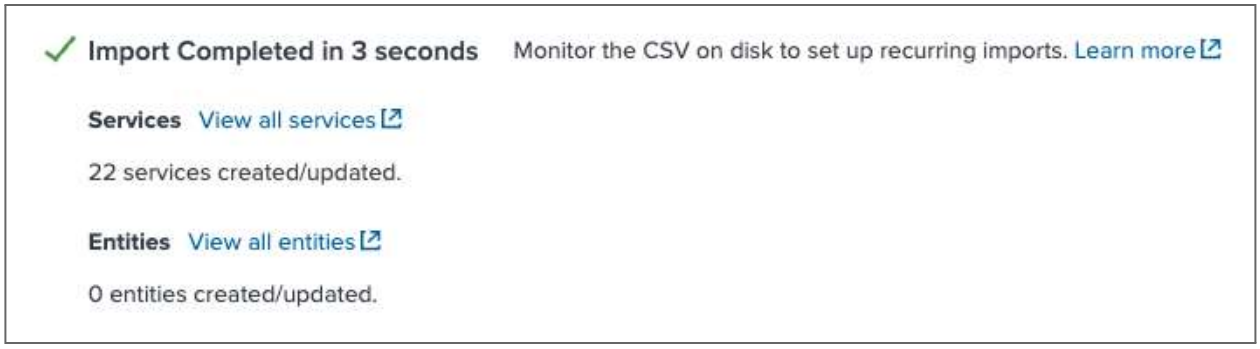
Services to be Imported | Service Dependency Tree | Entities to be Imported

6 services

Service Title	Service Description	Service Tags	Dependent Services	Link to Service Template
Splunk Widget Co.			Product Assembly Line, IIoT Monitoring, Order Management, Warehouse Management, Shipping Management, Inventory	
Product Assembly Line	Sub-service of Splunk Widget Co.		Robots, Misc Infra, Carts, Conveyor Belts	
Warehouse Management	Sub-service of Splunk Widget Co.		Forklifts	
IIoT Monitoring	Sub-service of Splunk Widget Co.		Drones, Turbines, Sensors	
Robots	Sub-services of Product Assembly Line		Welding Robots, Painting Robots, Automated Inspection	
Misc Infra	Sub-services of Product Assembly Line		ERP/CRM, 3rdPartyAPIs, 5G, WiFi	

When ready, select **Import**

and confirm it completed ok

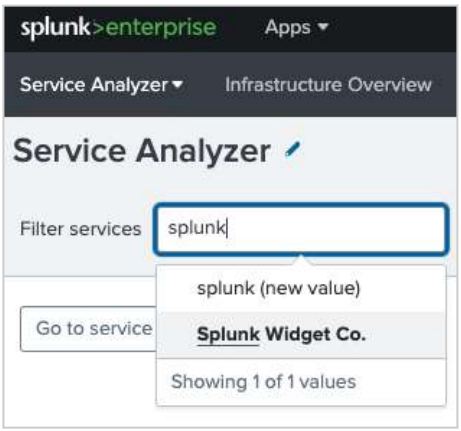


Let's now confirm everything is set up as needed.

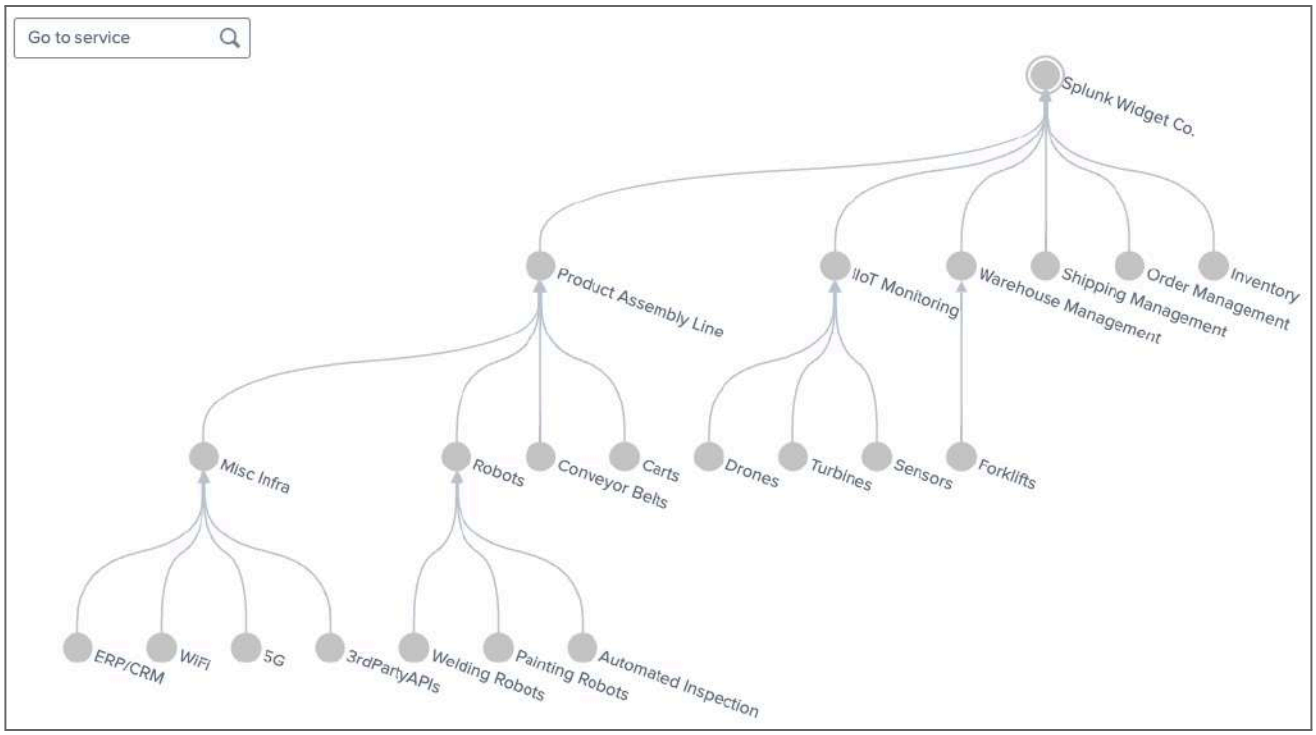
View Service Tree for Splunk Widget Co.

Return to the **Service Analyzer** view. You should see that there are two hierarchies represented, one for **Card Payments**, and one for **Splunk Widget Co.** We are going to filter only on **Splunk Widget Co.** from now on.

Type ***splunk*** into the **Filter services** input and select **Splunk Widget Co.** when it becomes available to choose.

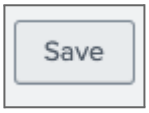


Once filtering is complete, you should see a view of everything contained within the configuration for Splunk Widget Co.



Note: All items will be greyed out because we have not yet created any KPIs for the services involved.

For convenience, we will save this view to become the new **Default Analyzer** view.



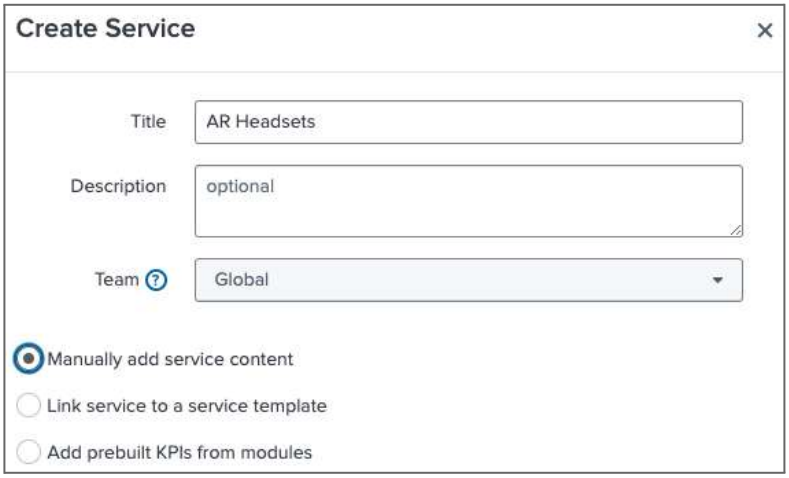
Add a new service to IIoT Monitoring

Before we start adding some KPIs for the service, we will quickly walk through the process of adding a new service to an existing service tree. Currently, for the **IIOT monitoring** service, we have 3 sub-services; **Drones**, **Turbines** and **Sensors**. We are going to add 1 more, namely **AR Headsets**.

Add a new service by selecting the **Configuration** tab from the main menu and then **Services** from drop-down.

Create a new service via the green button and drop-down

Name the service as appropriate, using the “manually add service content” option:

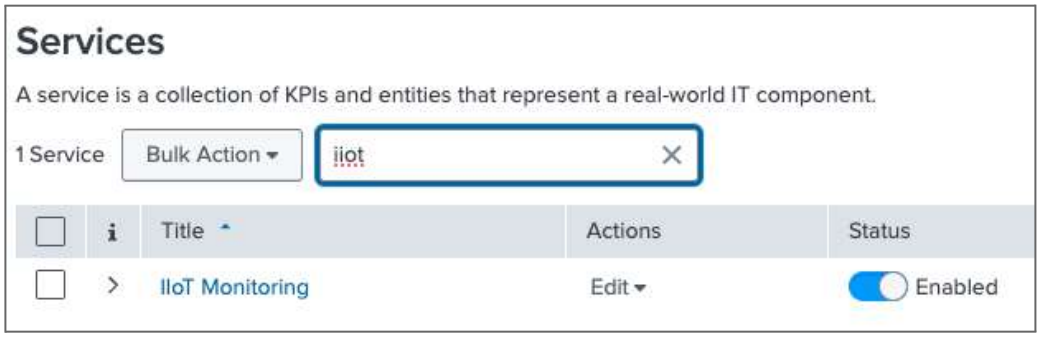


And then create via the green button

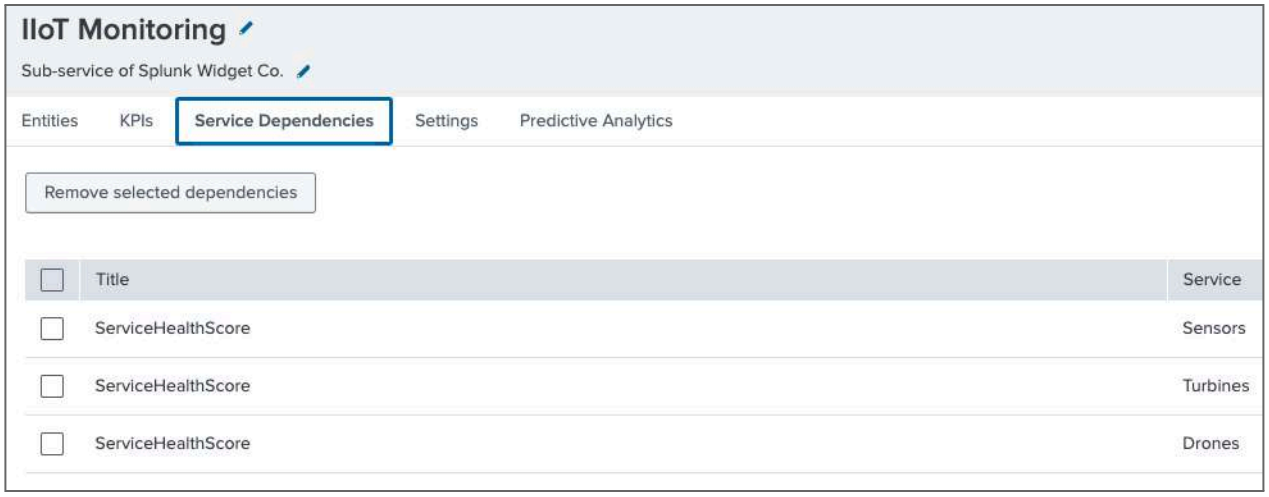
Now we have the basic service in place, we need to associate it to its parent service.

Via **Configuration > Services** in the main menu, find the **IIOT Monitoring service**.

You can use the filter to find it quickly:



Click on the services name (hyperlink) to edit the service, and then select the Service Dependencies tab



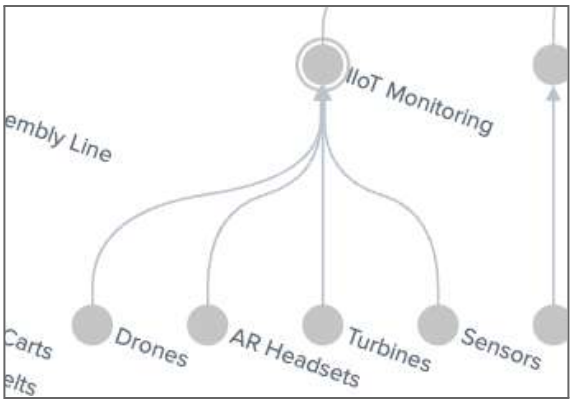
Click the

button.

Filter and find the **AR Headsets** dependency, select the **ServiceHealthScore** and click

when ready. And also ensure that you click

Return to the **Service Analyzer** (Default Analyzer) view to confirm your changes have taken place.


IIoT Monitoring
embly Line
Carts
elts
Drones
AR Headsets
Turbines
Sensors

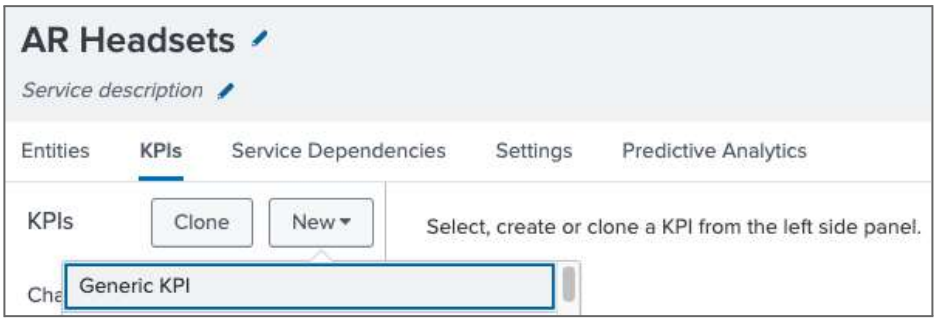
Add some KPIs

Using what you've learnt above, edit the services in the table below, to add the following KPIs to each of these services. Use the table here for reference, detailed instructions are below the table.

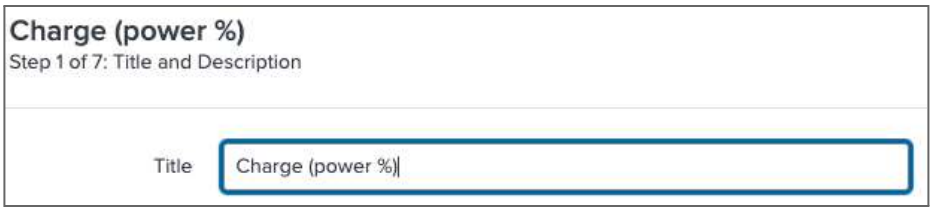
Service	KPIs (Title)	Example ranges	SPL search
AR Headsets	Charge (power %)	0-100	| makeresults | eval high = 99 | eval low = 90 | eval rand = round(((random() % high)/(high)) * (high - low) + low)
Drones	Charge (power %)	0-100	| makeresults | eval high = 49 | eval low = 0 | eval rand = round(((random() % high)/(high)) * (high - low) + low)
Painting Robots	Vibration, PaintLevels	0-50, 0-100	| makeresults | eval high = 50 | eval low = 40 | eval rand = round(((random() % high)/(high)) * (high - low) + low)
Liquid Washers	Temperature	0-40	| makeresults | eval high = 40 | eval low = 0 | eval rand = round(((random() % high)/(high)) * (high - low) + low)

Start by editing each service shown in column 1 (**Configuration** > **Services**, filter for the service needed and select it hyperlink to edit).

For each each of the KPIs in the table, use the generic KPI option when configuring, by select **Generic KPI** from the **New** menu choice in the UI, as per:

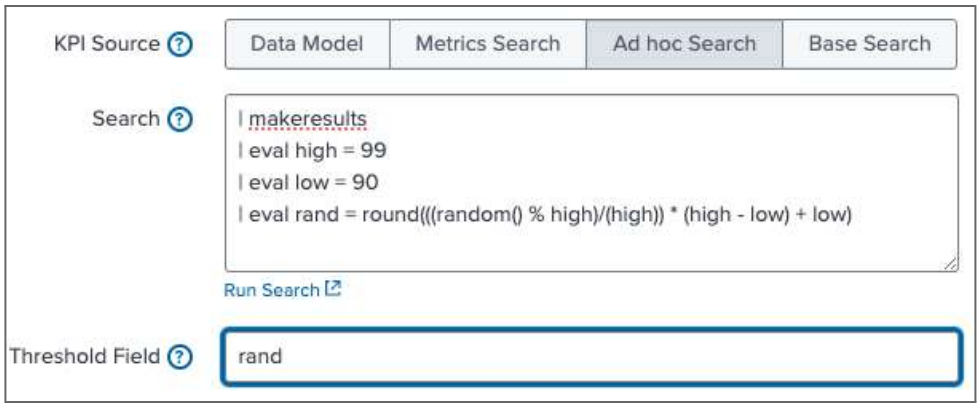


To name the KPIs, use the suggested titles in column 2 above e.g.



After naming each KPI, ensure you select **Next** (not **Finish**)

For each KPI, specify the search to use as per the column 4 above, and set the **Threshold Field** to "**rand**" (which is the output of the SPL search) e.g:

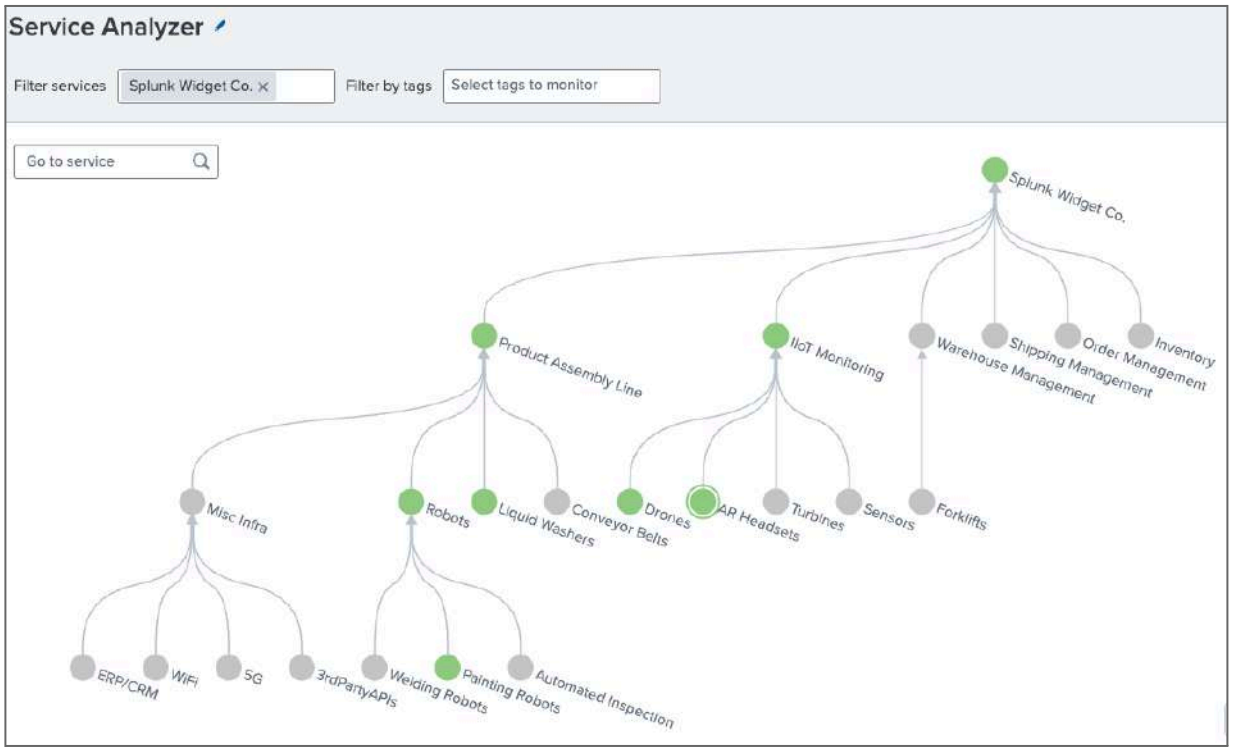


After adding the search and threshold field, click the **Finish** button (not **Next**)

Then ensure you save the updates

Repeat the above steps for KPI creation for **Drones**, **Painting Robots** and **Liquid Washers**.

When you have created all 5 KPIs, check your updates are taking effect in the **Service Analyzer**:



Q: We only made changes to 4 services, yet we are now seeing updates (green status) to 8 services. Why?

Q: Ignoring the services with no configuration (in greg), everything else is green (no red or amber). Why would that be?

Setting Thresholds

Seeing as one of our KPIs relates to how much battery charge is available, let's put some thresholds in place to warn us when recharging might need to be considered, plus a threshold for critically low charge.

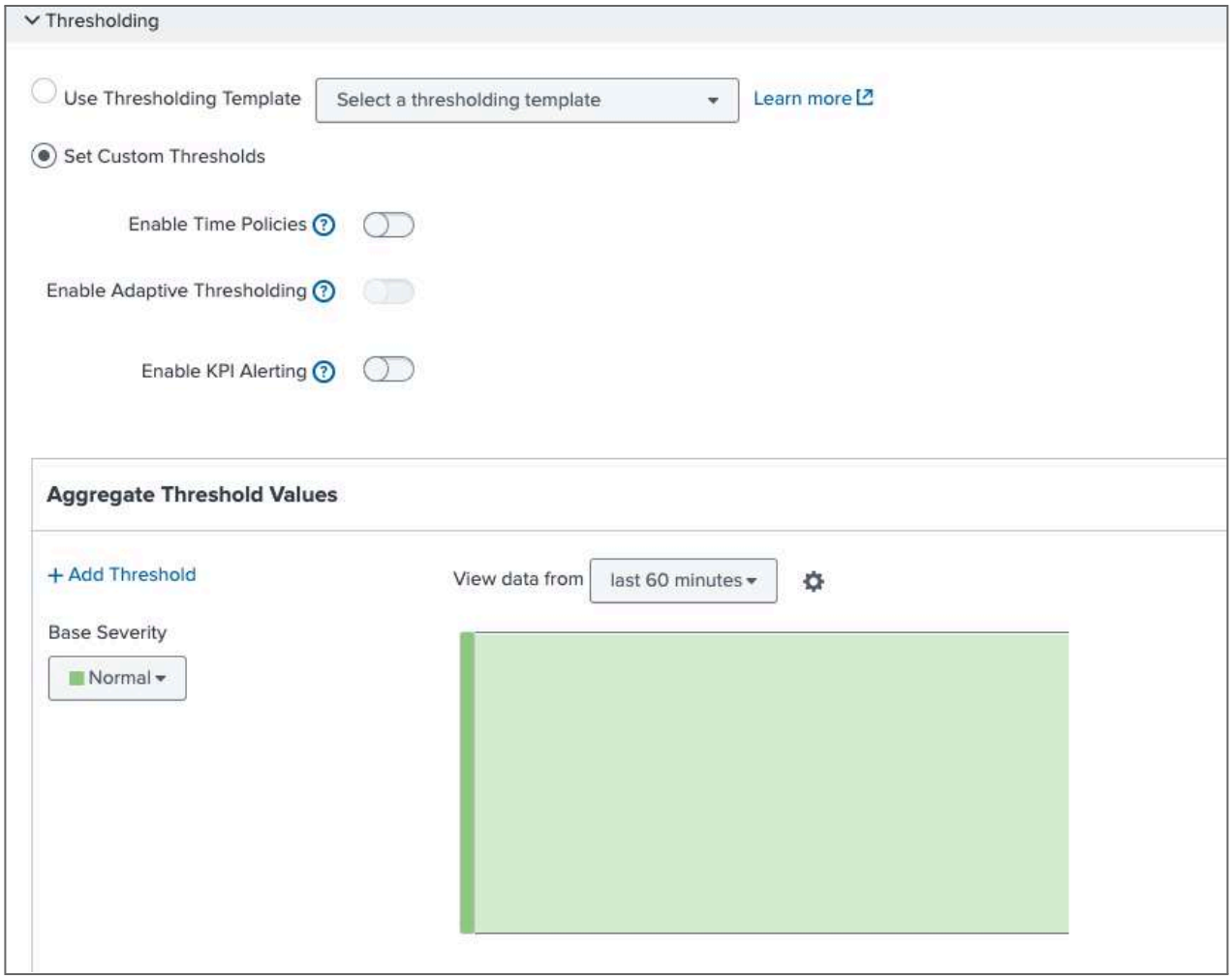
Note that for the **Drones** service, we added a KPI of **Charge**, which will be a random value between 0 and 49, every 5 minutes, as can be seen by the SPL we used:

```
| makeresults | eval high = 49 | eval low = 0 | eval rand = round(((random() % high)/(high)) * (high - low) + low)
```

This would be a good example to set thresholds to alert when charge is reduced to less than 50%. Anything above 50% should be considered normal or healthy.

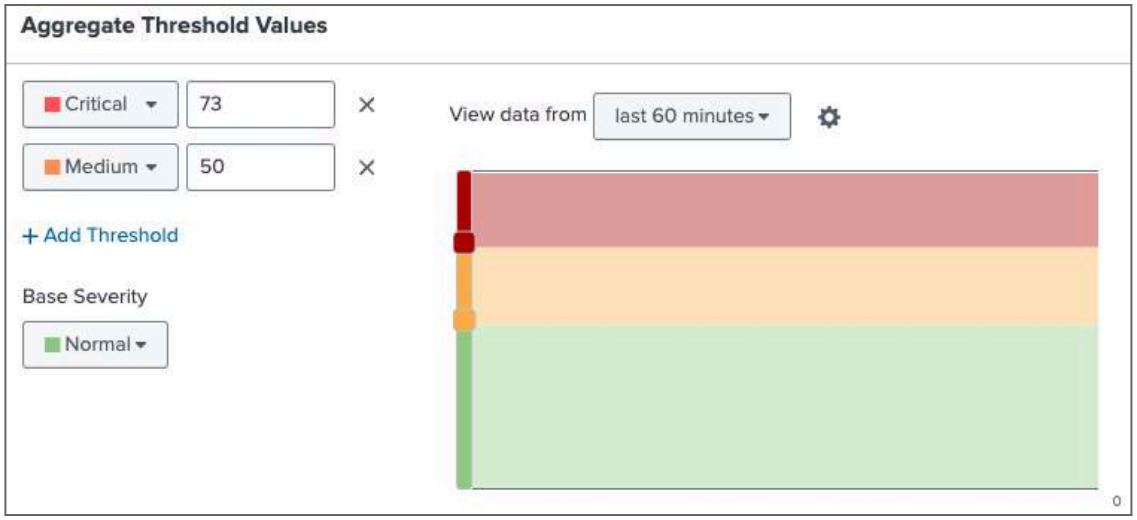
Navigate back to the service configuration for **Drones** and switch to the **KPIs** tab. Expand the Search and Calculate section for the **Charge** KPI, using the arrow icon, to verify the search used to evaluate the KPI.

Now expand the **Thresholding** section by selecting the arrow icon:



Note: there are many configuration options available to us, including the use of templates, for today, we are just going to create static custom thresholds:

Click the **+ Add Threshold** link a 3 times so that you end up with 3 levels of severity set, plus a **base severity** of **Normal**:



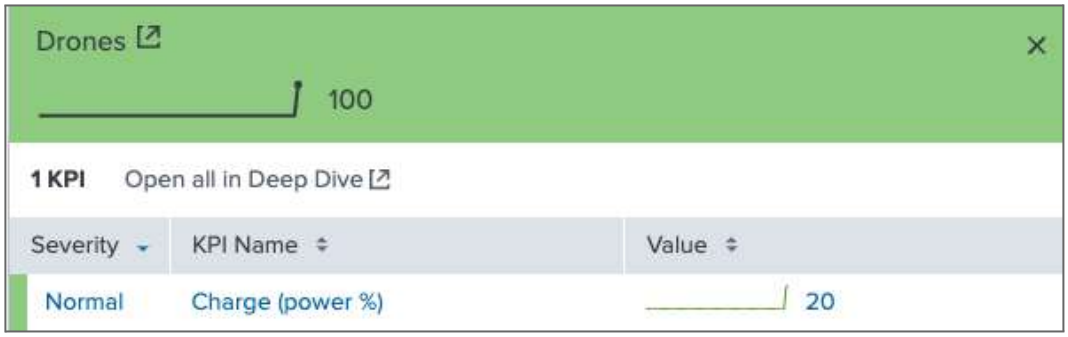
As we want to be alerted when power/charge decreases, we want to **Critical** to match low values (0-19), Medium to be between 20 and 49, and Normal to from 50 and above e.g.

When you've mirrored the settings above, ensure that you save your progress

As we are updating KPI values every 5 mins, it may take a while for effects to filter through to the service analyzer.

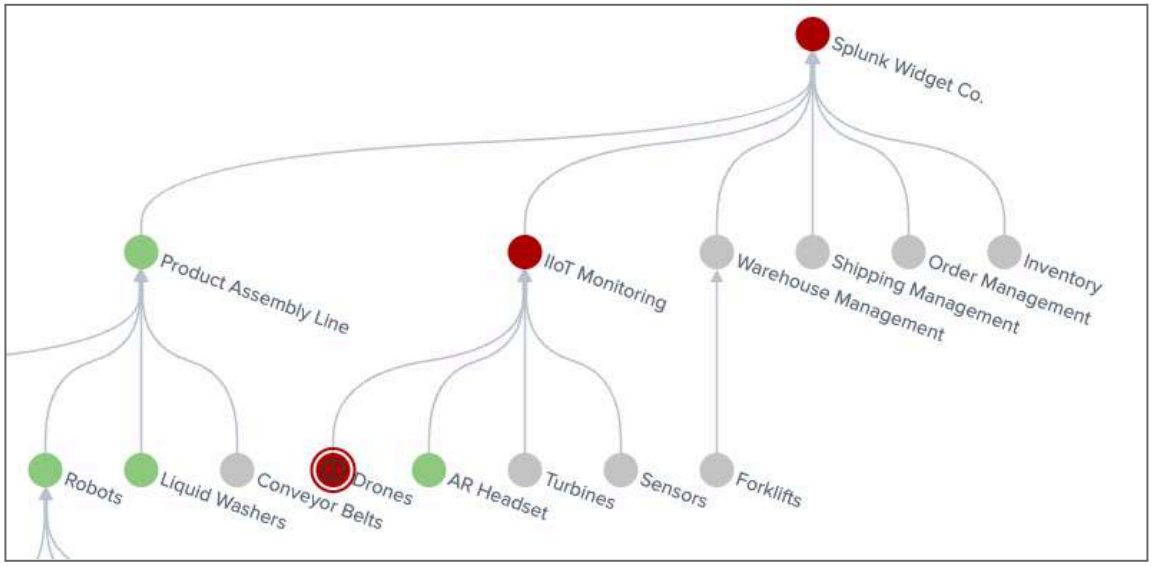
When the **Charge** KPI value updates, does the KPI for it change colour as expected?

Before we made the changes, a value of 20 would show as Normal (green):



With the thresholds now in place, we see the desired results:

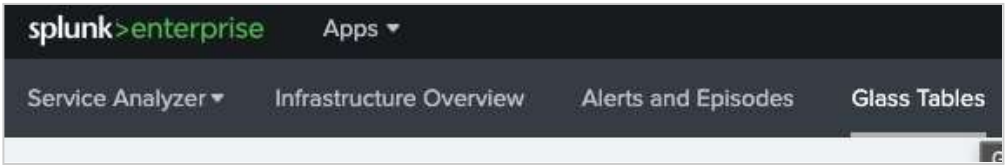
You should also notice that other services are affected by this KPI threshold breach. Why is that?



Build custom Glass Tables: Business Services Overview

Now that we have some KPIs to work with, we can start to explore how we could make use of these in a dashboard view. For this part of the lab, we will build 2 example views. One that is high-level and that might appeal to management, in terms of generic health of operations, and then a second view that has more technical detail, to represent specific areas of technology health.

Navigate to the **Glass Table** UI via the main menu



Create a new Glass Table

We will target this GT at the business, so let's give a name that reflects the audience, such as "Company Overview" and click on the green **Create** button to finish.

Click on the Glass Tables title (hyperlink) to start editing it.

You will see a blank canvas for now (as we have not created anything yet).

Select the **Edit** button to continue

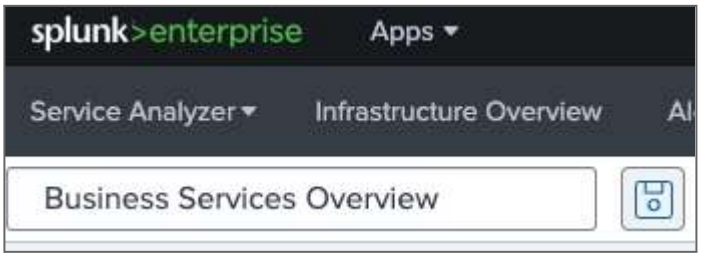
Note in the **Configuration** panel that there are many options we might leverage for a production-ready Glass Table, such as appropriate width/height settings, background colours and images, useful when presenting views on communal screens etc.

Download a background image from https://splk.it/Manu-Lab-Assets.

Choose either

- **GT-background-1.jpg** or (set Width=1400, height=930) or
- **GT-background-2.jpeg** (set Width=1400, height=790)

ℹ️ **Note: changes are not saved unless you select the save icon in the Glass Table menu**



For this overview, we will add 4 health scores for:

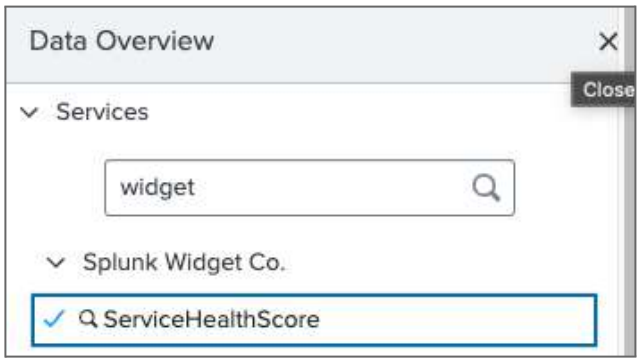
- Splunk Widget Co.
- Product Line Assembly
- IIoT Monitoring
- Warehouse Management

Add some Service Health scores to the dashboard using the **Data Overview** icon - this provides access to both health score and KPIs

Add ServiceHealthScore for Cloud services by filtering on “widget” from the **Services** search bar in the **Data Overview** tab, and clicking on the arrow to expand the list of health scores and KPIs.

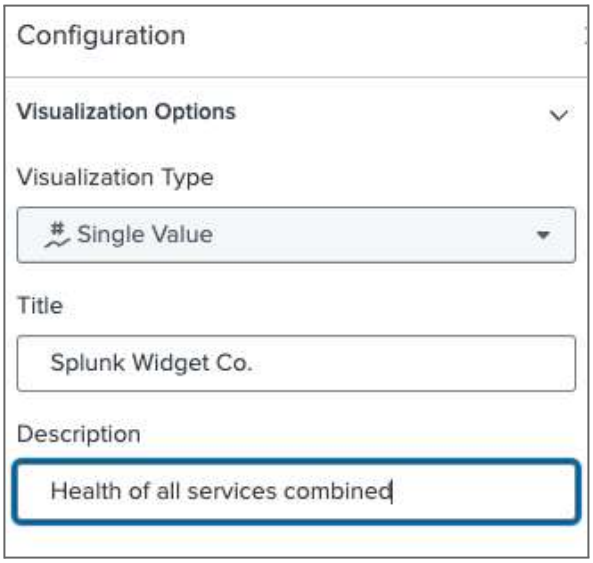
and then selecting

Close the Data Overview panel



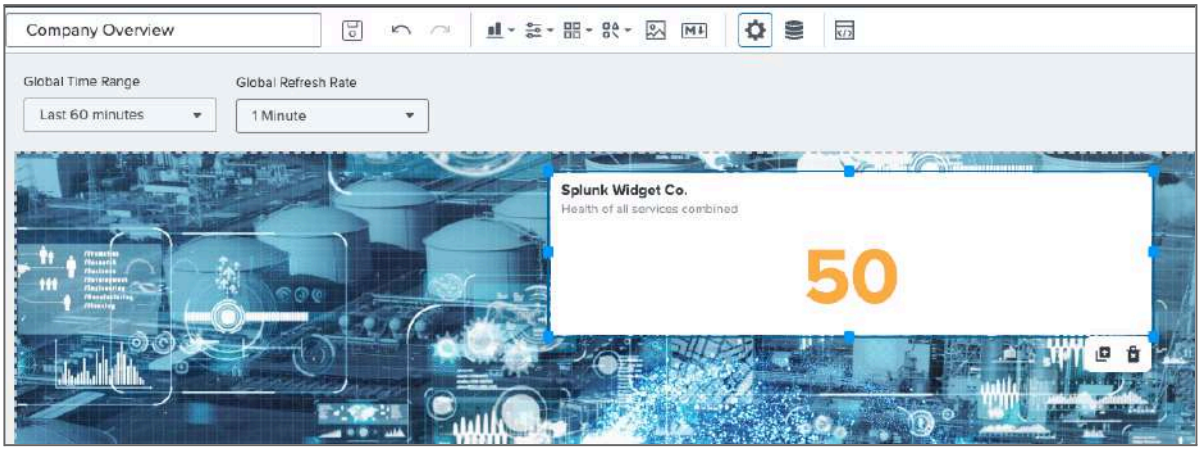
The newly added health score will now appear on the canvas. It can be moved, resized and configured. Select it to open the Configuration tab for the health score.

In the **Visualisation Options**, give the score a name “Splunk Widget Co.” and optional description:



Move to the **Positions & Size** section, and use the values shown below:

Your dashboard should look similar to:

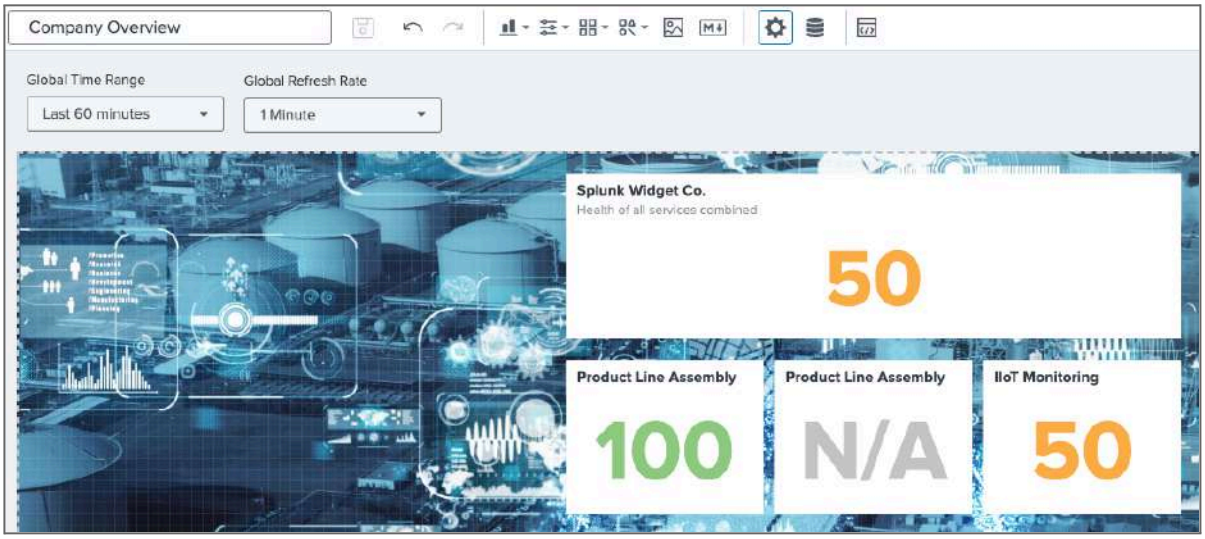


Follow the same steps as above to also add the ServiceHealthScores from

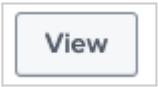
- Warehouse
- IIoT Monitoring
- Product Line Assembly

But give them a width of 180 pixels and height of 140.

So that you end up with the following:

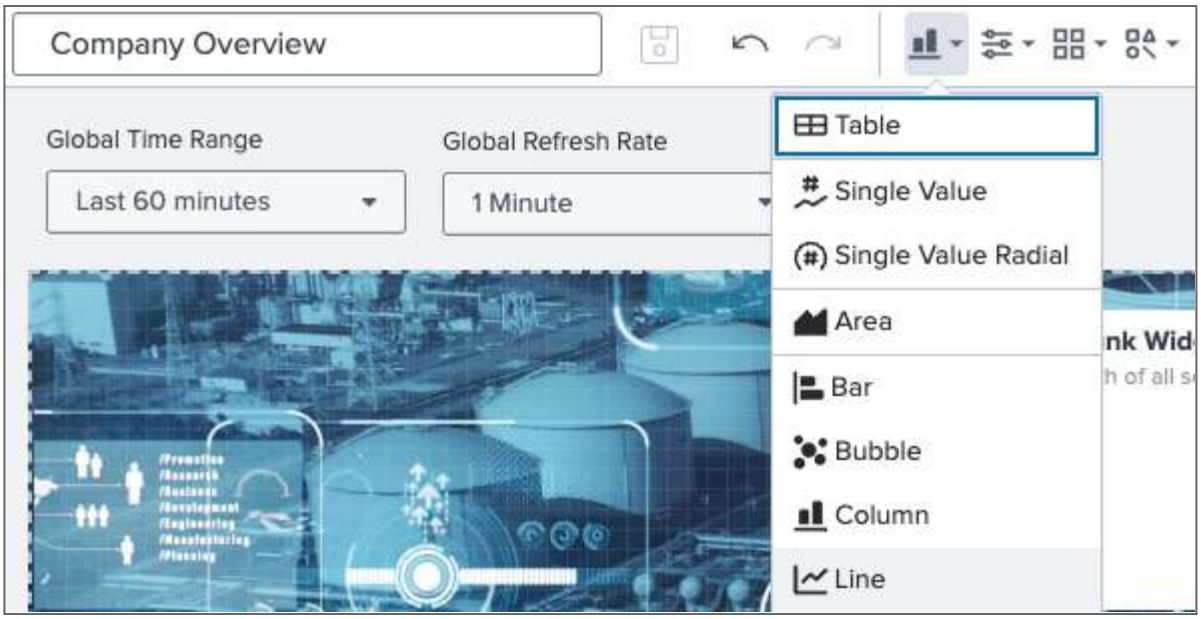


Save your work  and then **View** your work

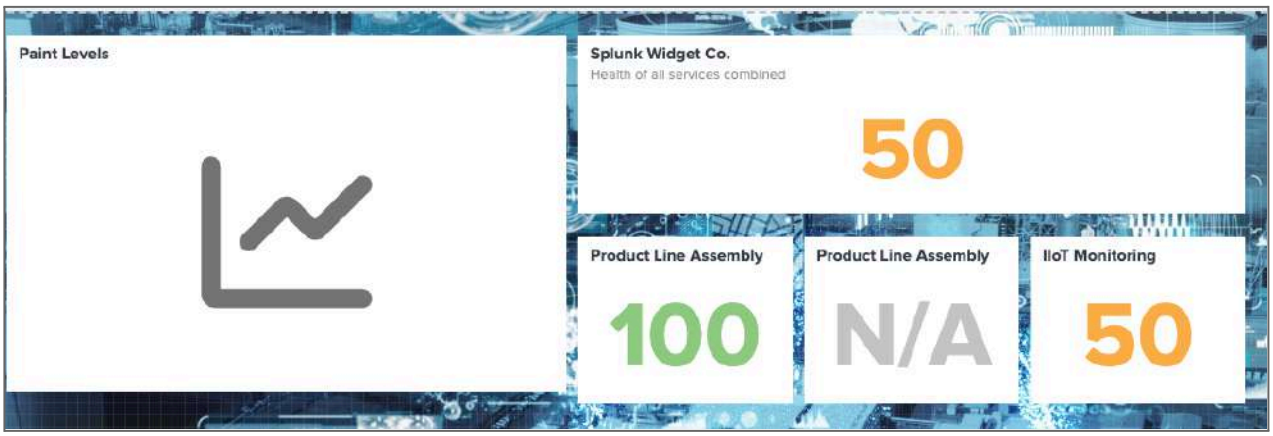


Management are happy with this view but one manager in particular would like to see the KPI for **Robot Paint Levels** displayed on here, as it is of particular importance to them. They've asked to see the performance of 5G over time, so we will add a line chart to our current view.

Select this option from the list of visualisation options

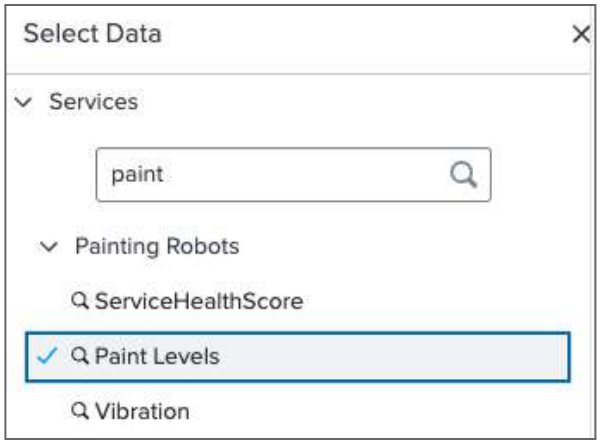


By selecting **Line**, a new image will appear which will need configuring. Move it and size it to your preference:



We now need to connect this view to a data source i.e. the KPI value for **Paint Levels**.

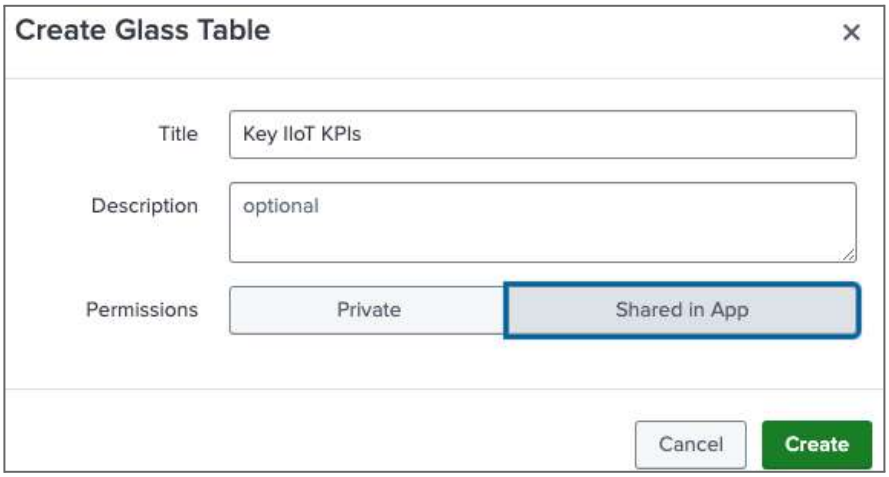
Perform this in the Data Configurations section for the component:



Confirm that paint levels are now displayed also:

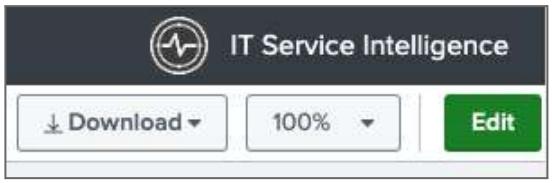
Build custom Glass Tables: Infrastructure Overview

Via the **Glass Table** option in the main menu, create a new Glass Table called “Key IIOT KPIs”



Edit using the hyperlink option

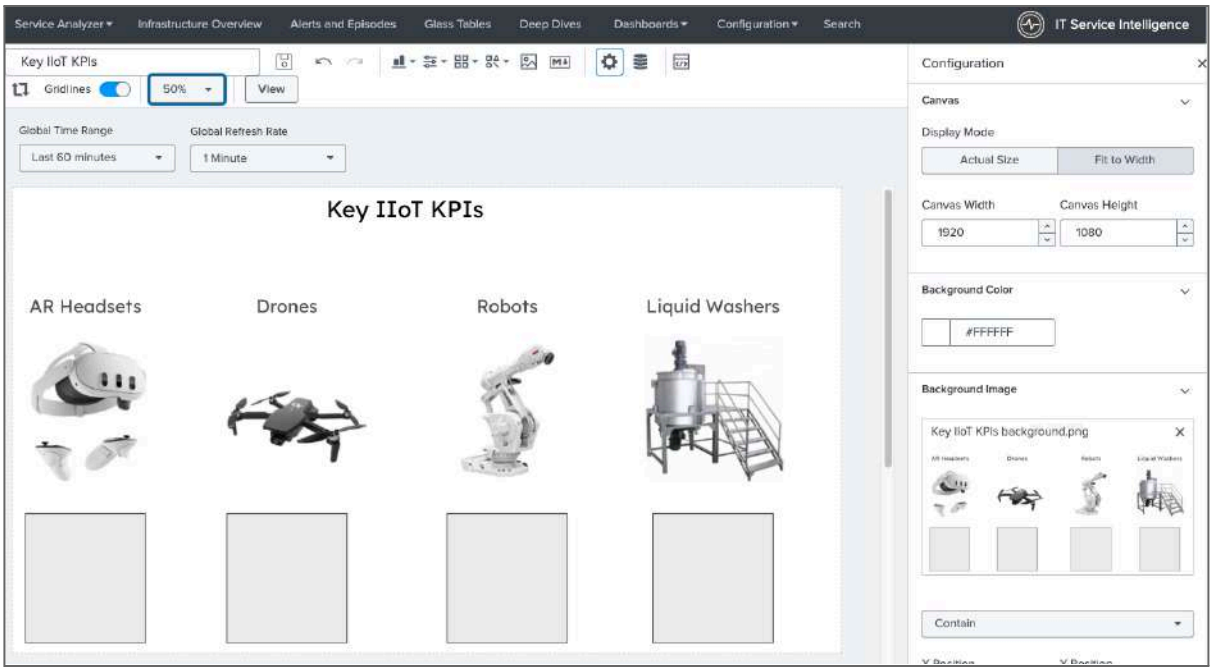
And select Edit in the Glass Table view



For this Glass Table, we are going to add some custom images, which you can downloaded from here: https://splk.it/Manu-Lab-Assets.

Download “Key IIoT KPIs background.png”

Add this as a background image to your Glass Table and set **Display Mode** to ***Fit to Width***.

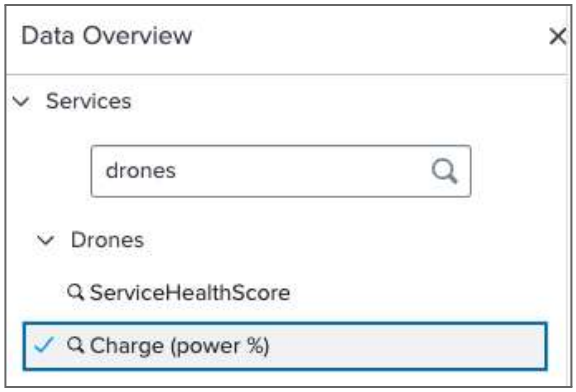


Add the KPIs for the following, into the grey box placeholders:

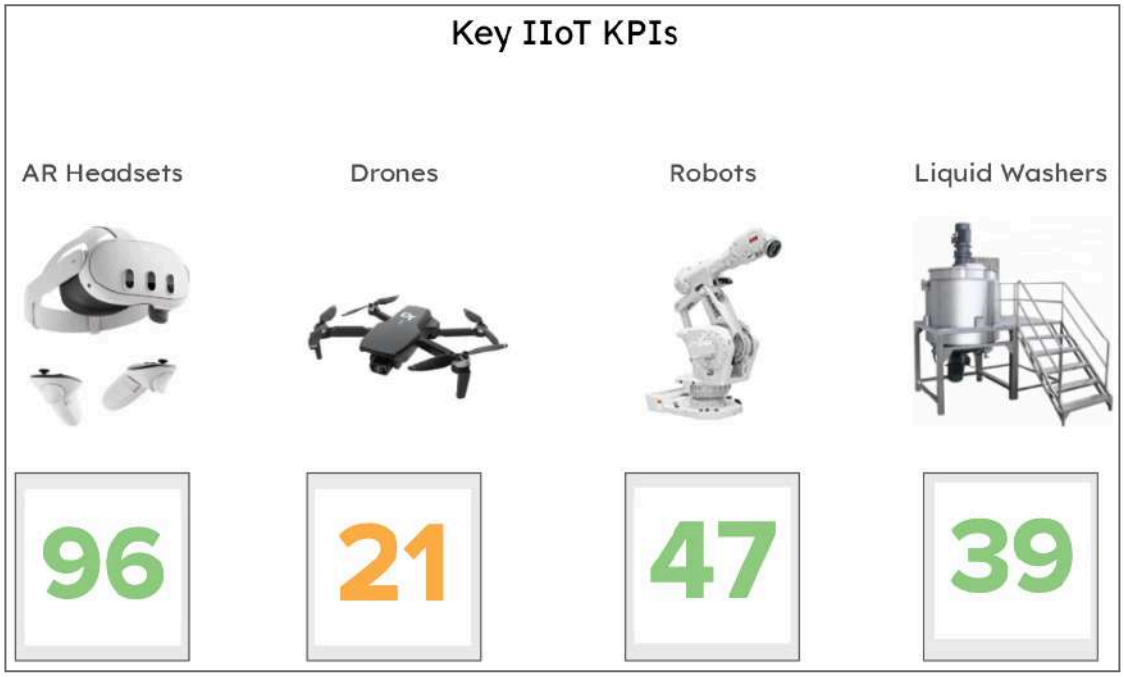
- Drones - Charge (power %)
- AR Headsets - Charge (power %)
- Painting Robots - Paint Levels
- Liquid Washers - Temperature

Use the **Data Overview** icon to make the additions

Use the search & filter view to find the 4 required KPIs e.g.

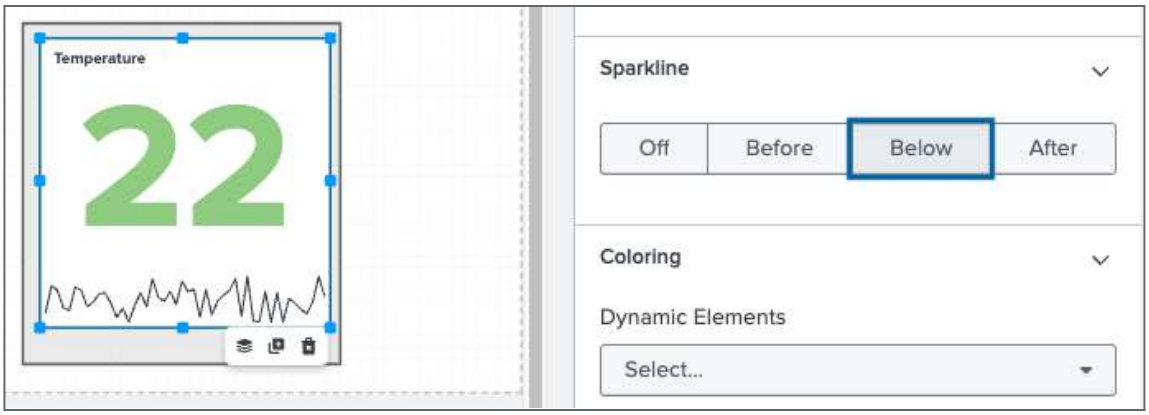


You should end up with something like this:

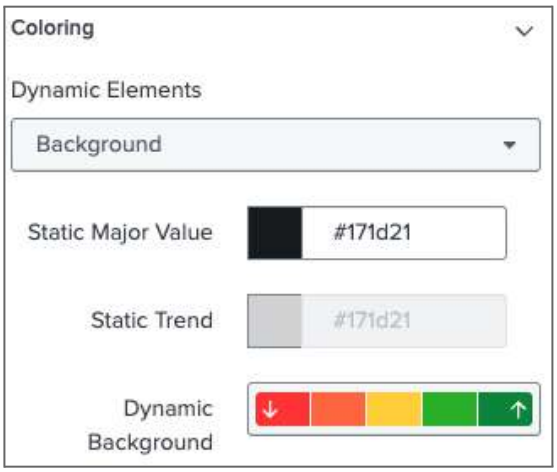


OPTIONAL: Add the KPI names to each value.

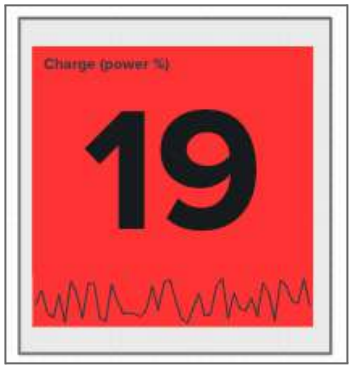
For each KPI, add a sparkline visual to show trend values over time, using the *Sparkline* settings panel in the **Configuration** panel.



Make one of the KPIs more prominent by editing the colour settings in the **Coloring** panel of **Configuration**.



To produce:



Save your work.

Connecting Glass Tables

Return to the first Glass Table created; “Company Overview”.

Ensure you are in edit mode and then select the **Paint Levels** KPIs component.

Locate the **Drilldown Settings** section and select **+ Add Interaction**

From the menu, select **Glass Table**, as we are going to link it to our KPI Glass Table, but note the various different options available.

Use the options as shown below:

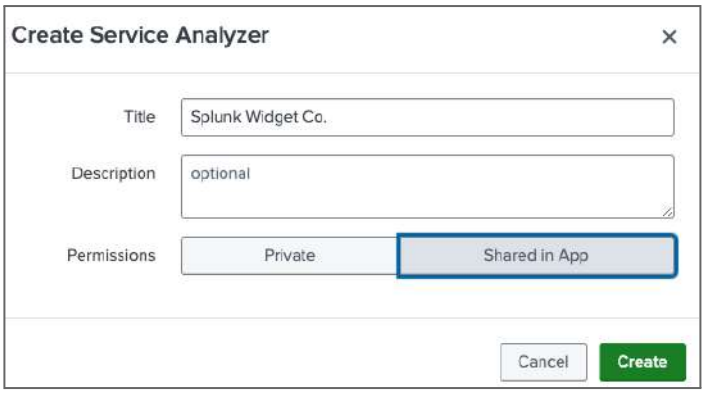
And ensure you select the **Apply** button

Now test the link capability by viewing the **Company Overview** glass table

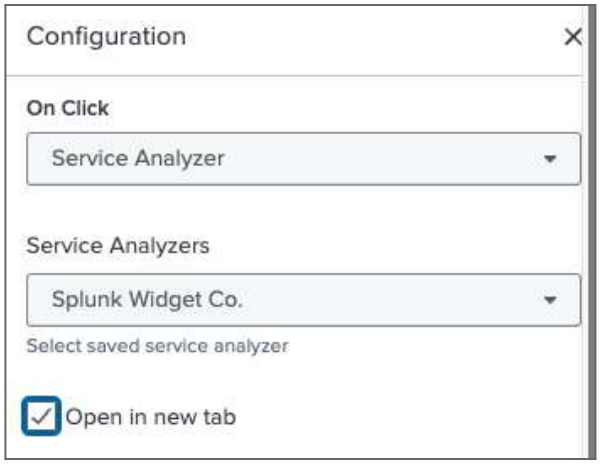
Click on the line chart to drilldown

Finally, see if you can connect a KPI to a **Service Analyzer**. You may need to create a new **Service Analyzer** view first, in order for it to be available as a drilldown option.

Hint 1:



Hint 2:


Configuration
On Click
Service Analyzer
Service Analyzers
Splunk Widget Co.
Select saved service analyzer
Open in new tab

Exercise 9 - Build Your Own Service

Description

Now that you have learned some of the key features within ITSI, try and build a service view that aligns to your role, team or department.

Start by picking a key service - something that Line of Business cares about, and has a relatively complex IT stack supporting it.

Focus on something that provides maximum business value. Then identify 4 or 5 key technology components that underpin that service.

Finally, for each technical component, how would you determine if it was performing well or not? I.e. what are they KPIs you'd be interested in?

See how far you can get in building that out in the remaining lab time - and ask for help!

Good luck.

Answers: Exercise 5

Q1: Using the "interesting fields" list in the UI, can you determine how many wind turbines there are?

A: 4

Q2: On what date did a turbine report being offline? Which turbine?

A: Dec 28th. WT01

Q3: Which wind turbine produced the greatest speed? What was the speed and when did it happen?

A: WT02. 35.4mph. Dec 2nd

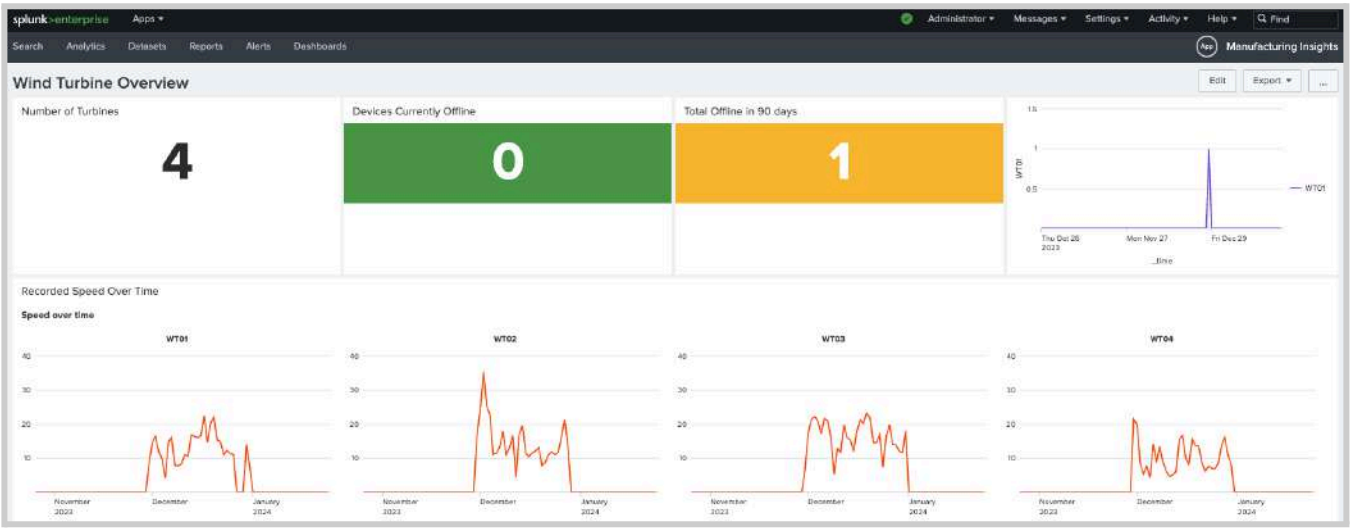
Q4: What was significant about the speed of WT01 on Dec 27th/28th? How does it relate to the view of offline devices over time?

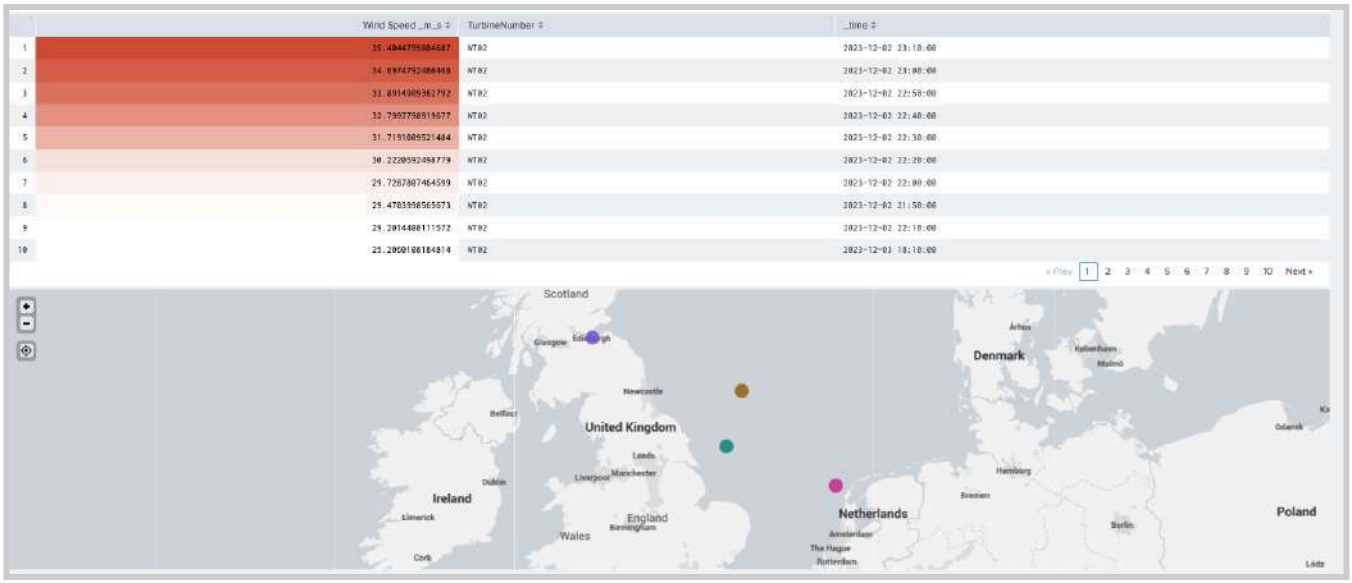
A: It reported a speed of zero. The same time as "offline" device was reported.

Q5: What Countries are the turbines located in or near?

A: Scotland (Edinburgh), English Coast/North Sea, Netherlands

Final Dashboard





Answers: Exercise 7

Glass Tables

Q1: Service Health - which of the 4 services has the lowest/worst health score?

A: Confirmation / 24

Q2: KPIs - how many Fraud alerts have occurred in the last hour?

A:45

Q3: What's the main reason that Confirmation has a low score?

A: 101 Failures

Q4: What technical components are involved in this degradation?

A: Arcot 3DS + CCM

Service Analyzer

Q5: There are actually a number of services impacting Card Payments - name 2 of them. HINT: focus on the root cause.

A: Fraud, Social Sentiment and Customer Communication Management.

Q6: How many are there and what are their severities?

A:4. Severities will change over time - it's a live view

Deep Dive

Q7: Which KPIs look particularly problematic?

A: Response Rate (but there may be others)

Q8: How many events have there been in the last 2 hours?

A: Depends on demo data and time range selected

Q9: How many are there now?

A: less than there were in the previous view!

Service Creation

Q10: Are your new KPIs appearing and do they have values?

A: Yes, you should have some values (after 5 mins at most)

Q11: What else do you notice about the service tree?

A: The new services are not connected to any other service