The bridge to possible

Using Splunk and OpenTelemetry for Centralized Insights To Achieve Your Sustainability Goals

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Aman Sardana, Sr. Product Architect, CCIE #63584

BRKGRN-1022

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Agenda

- Why sustainability matters
- OpenTelemetry
- Sustainability outcomes with Splunk and Cisco Intersight
- Demo
- How Cisco can help

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Obtain actionable sustainability insights for your infrastructure in under an hour

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Cisco Webex App

https://ciscolive.ciscoevents.com/ciscolivebot/#BRKGRN-1022

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How

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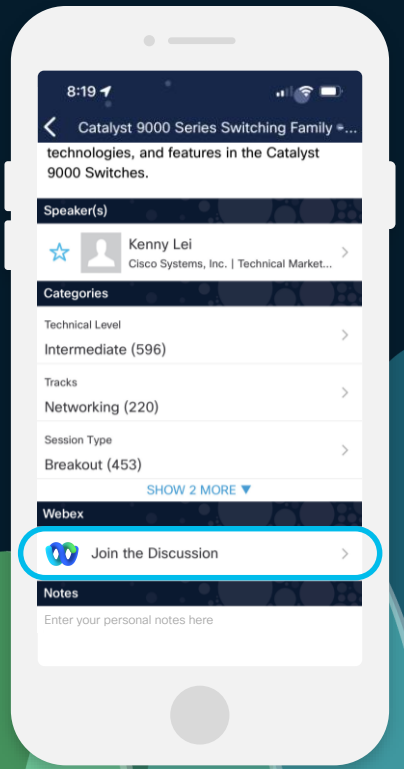

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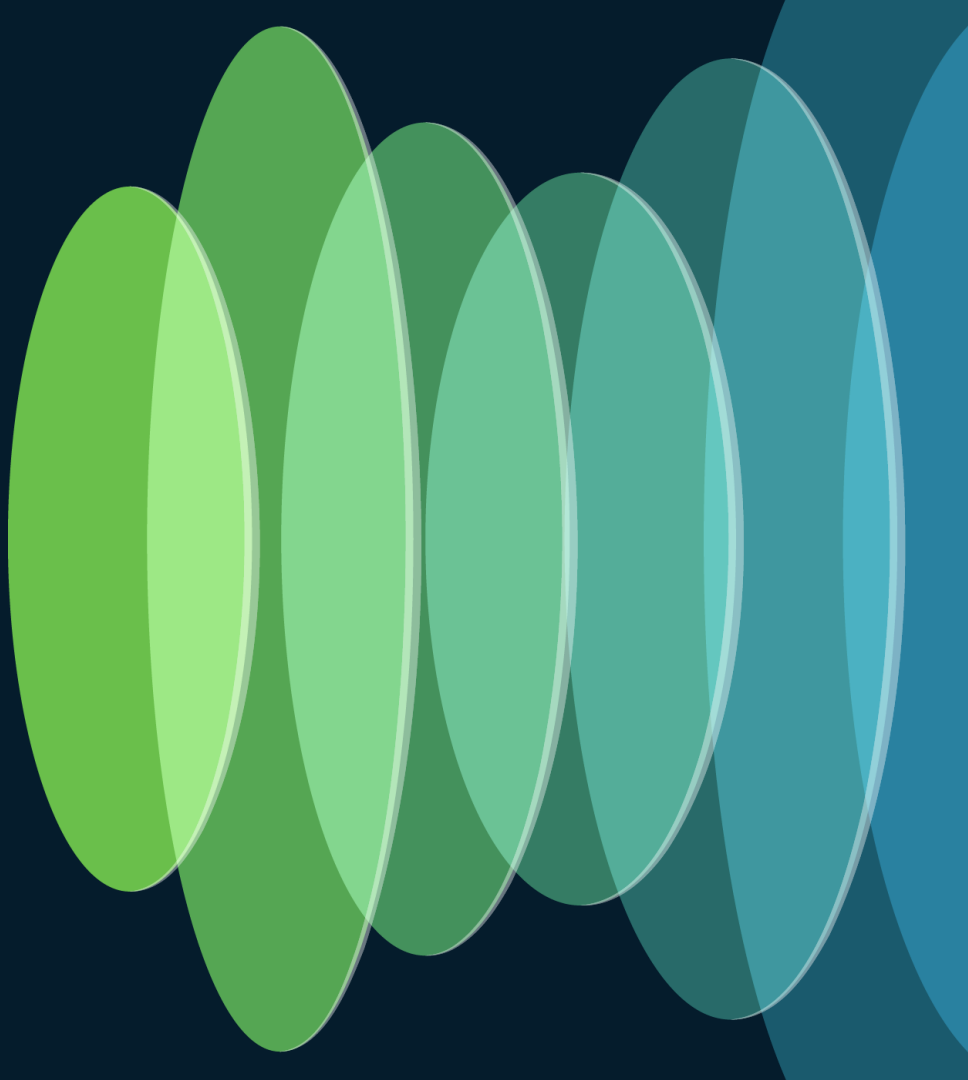
Why sustainability matters



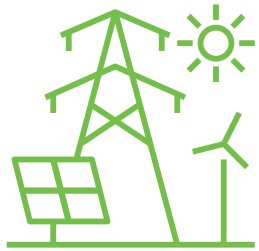
Sustainability in IT matters

4%

Estimated contribution of IT's direct impact on global greenhouse gas emissions[1]

20%

Estimated influence IT can have on reducing impact in other areas outside of IT[2]



Make sustainability a part of your management lifecycle

Sources: 1. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4424264
2. SMARTer2030 – ICT Solutions for 21st Century Challenges, GeSI 2015

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Calculating CO_2 equivalent emissions

Power (kW) x Time duration (hours) = kWh

Energy

$$\text{kWh} \times \frac{CO_2E\ (\text{grams})}{\text{kWh}} = CO_2E$$

Energy — Carbon intensity — CO_2 Equivalent Emissions

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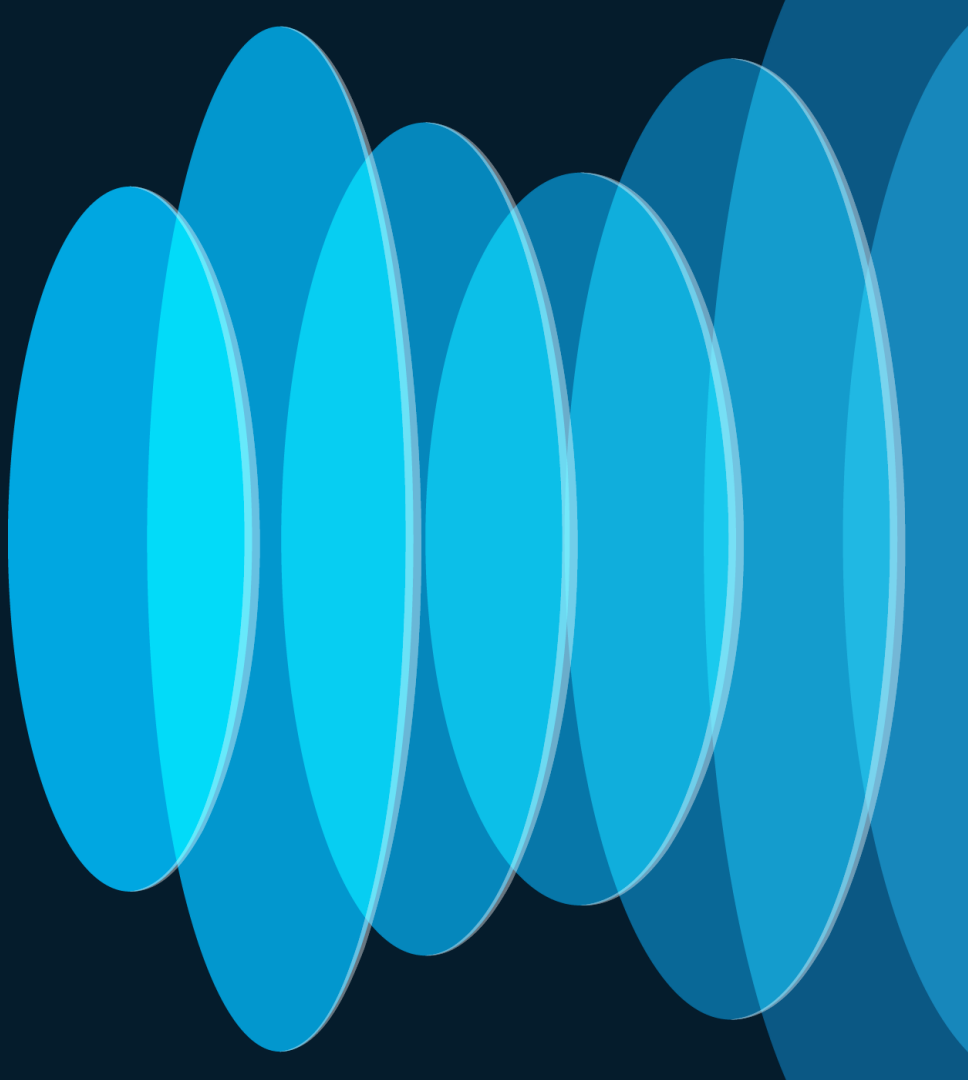
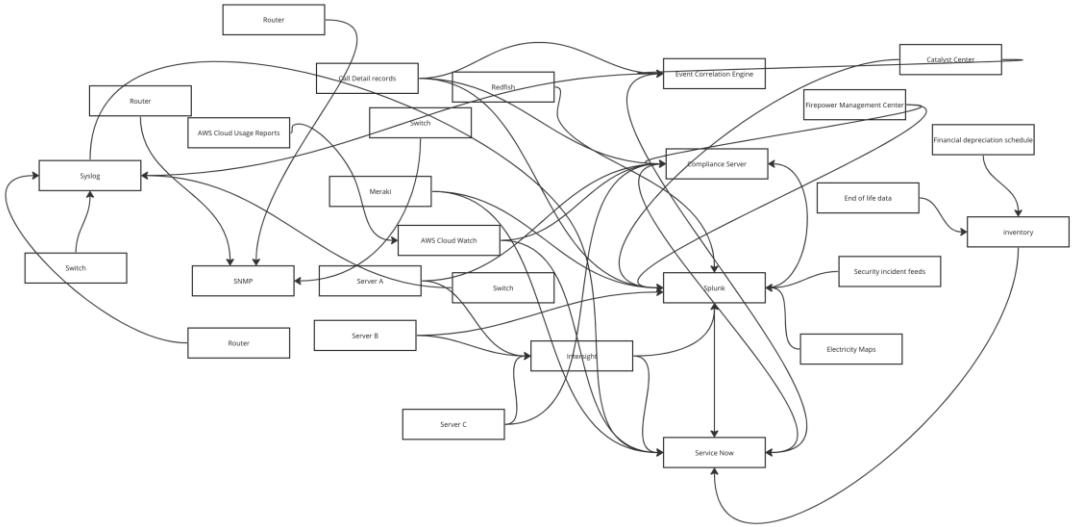
OpenTelemetry and how it can help



Current telemetry pipeline



Many different…

- Device types
- Transport protocols
- Data formats
- Units

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What if it was this?

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OpenTelemetry allows you to focus on actionable insights by standardizing data export, import, and normalization.

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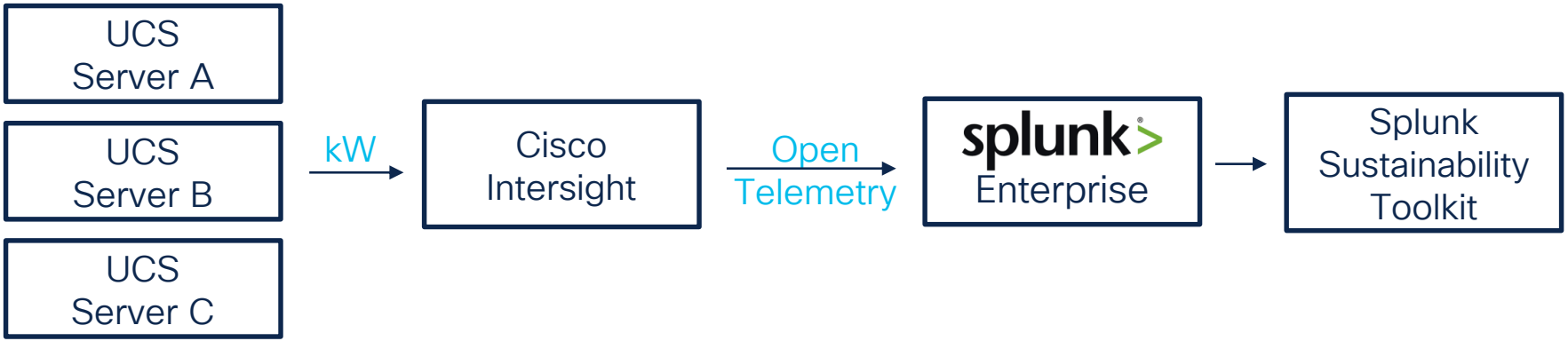
What we will demonstrate



OTLP – OpenTelemetry Protocol
(gRPC over HTTPS)

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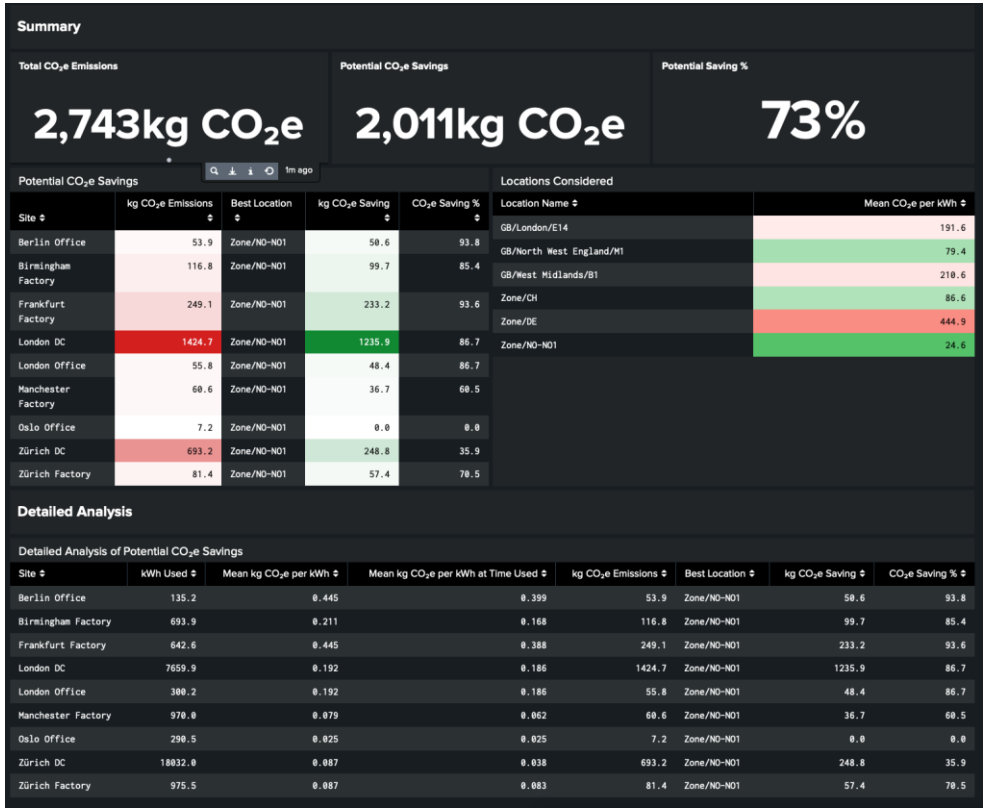
Splunk Sustainability Toolkit for actionable insights



Summary

Total CO_2e Emissions	Potential CO_2e Savings	Potential Saving %
2,743kg CO_2e	2,011kg CO_2e	73%

1m ago

Potential CO_2e Savings

Site	kg CO_2e Emissions	Best Location	kg CO_2e Saving	CO_2e Saving %
Berlin Office	53.9	Zone/NO-NO1	50.6	93.8
Birmingham Factory	116.8	Zone/NO-NO1	99.7	85.4
Frankfurt Factory	249.1	Zone/NO-NO1	233.2	93.6
London DC	1424.7	Zone/NO-NO1	1235.9	86.7
London Office	55.8	Zone/NO-NO1	48.4	86.7
Manchester Factory	60.6	Zone/NO-NO1	36.7	60.5
Oslo Office	7.2	Zone/NO-NO1	0.0	0.0
Zürich DC	693.2	Zone/NO-NO1	248.8	35.9
Zürich Factory	81.4	Zone/NO-NO1	57.4	70.5

Locations Considered

Location Name	Mean CO_2e per kWh
GB/London/E14	191.6
GB/North West England/M1	79.4
GB/West Midlands/B1	210.6
Zone/CH	86.6
Zone/DE	444.9
Zone/NO-NO1	24.6

Detailed Analysis

Detailed Analysis of Potential CO_2e Savings

Site	kWh Used	Mean kg CO_2e per kWh	Mean kg CO_2e per kWh at Time Used	kg CO_2e Emissions	Best Location	kg CO_2e Saving	CO_2e Saving %
Berlin Office	135.2	0.445	0.399	53.9	Zone/NO-NO1	50.6	93.8
Birmingham Factory	693.9	0.211	0.168	116.8	Zone/NO-NO1	99.7	85.4
Frankfurt Factory	642.6	0.445	0.388	249.1	Zone/NO-NO1	233.2	93.6
London DC	7659.9	0.192	0.186	1424.7	Zone/NO-NO1	1235.9	86.7
London Office	300.2	0.192	0.186	55.8	Zone/NO-NO1	48.4	86.7
Manchester Factory	970.0	0.079	0.062	60.6	Zone/NO-NO1	36.7	60.5
Oslo Office	290.5	0.025	0.025	7.2	Zone/NO-NO1	0.0	0.0
Zürich DC	18032.0	0.087	0.038	693.2	Zone/NO-NO1	248.8	35.9
Zürich Factory	975.5	0.087	0.083	81.4	Zone/NO-NO1	57.4	70.5

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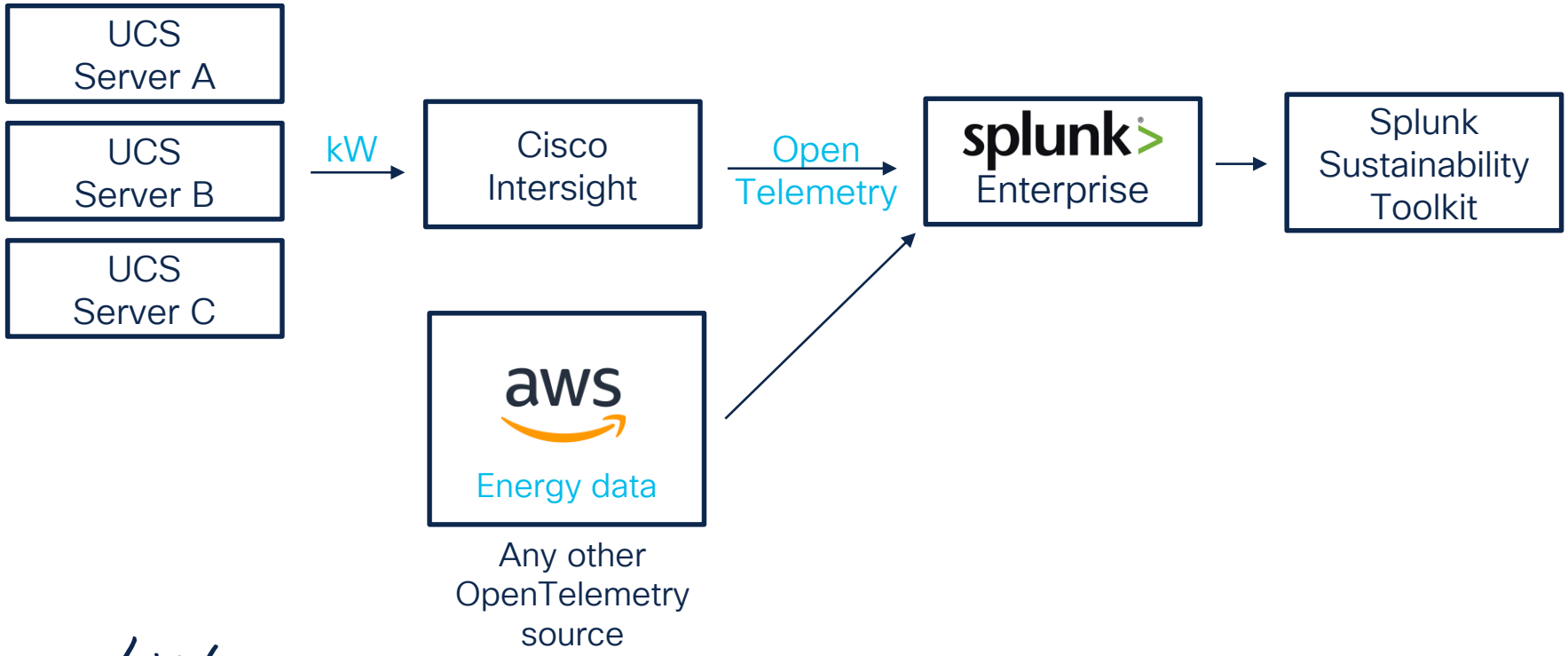
Don’t have Intersight yet?



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OpenTelemetry (OTel)

A common format for…

Metrics

Traces

Logs

OTLP – OpenTelemetry Protocol
(gRPC over HTTPS)

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OTel support

Vendors

Observability tools

Cloud platforms

Analytics and network management

See more at https://opentelemetry.io/ecosystem/vendors/

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OpenTelemetry architecture

OTLP – OpenTelemetry Protocol (gRPC over HTTPS)

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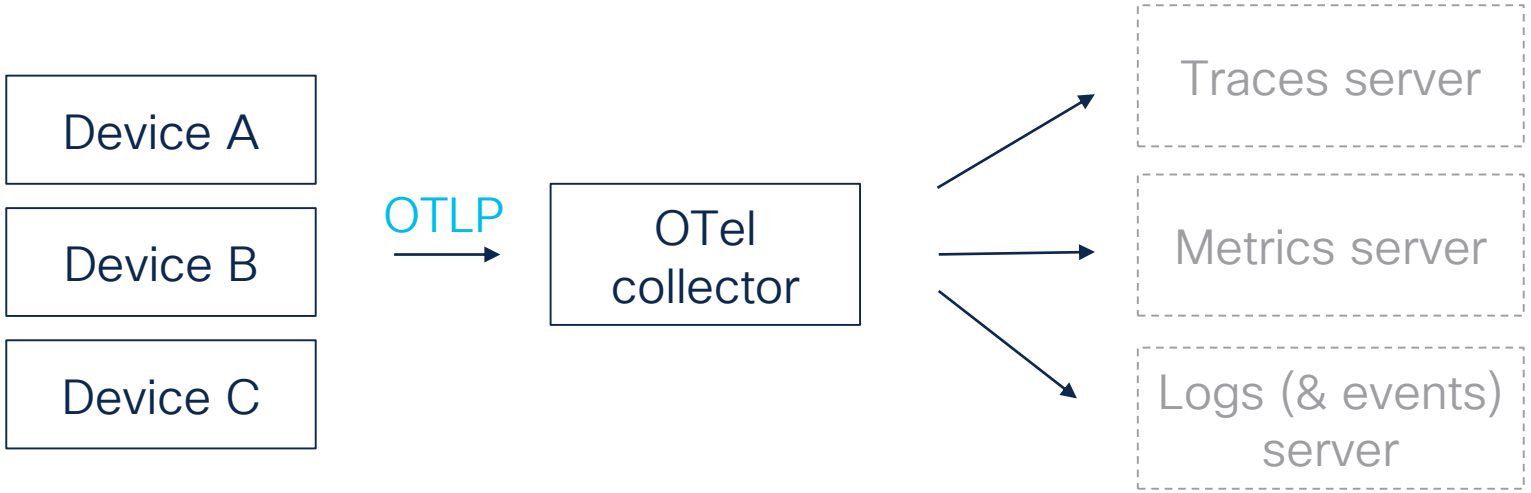
OpenTelemetry architecture



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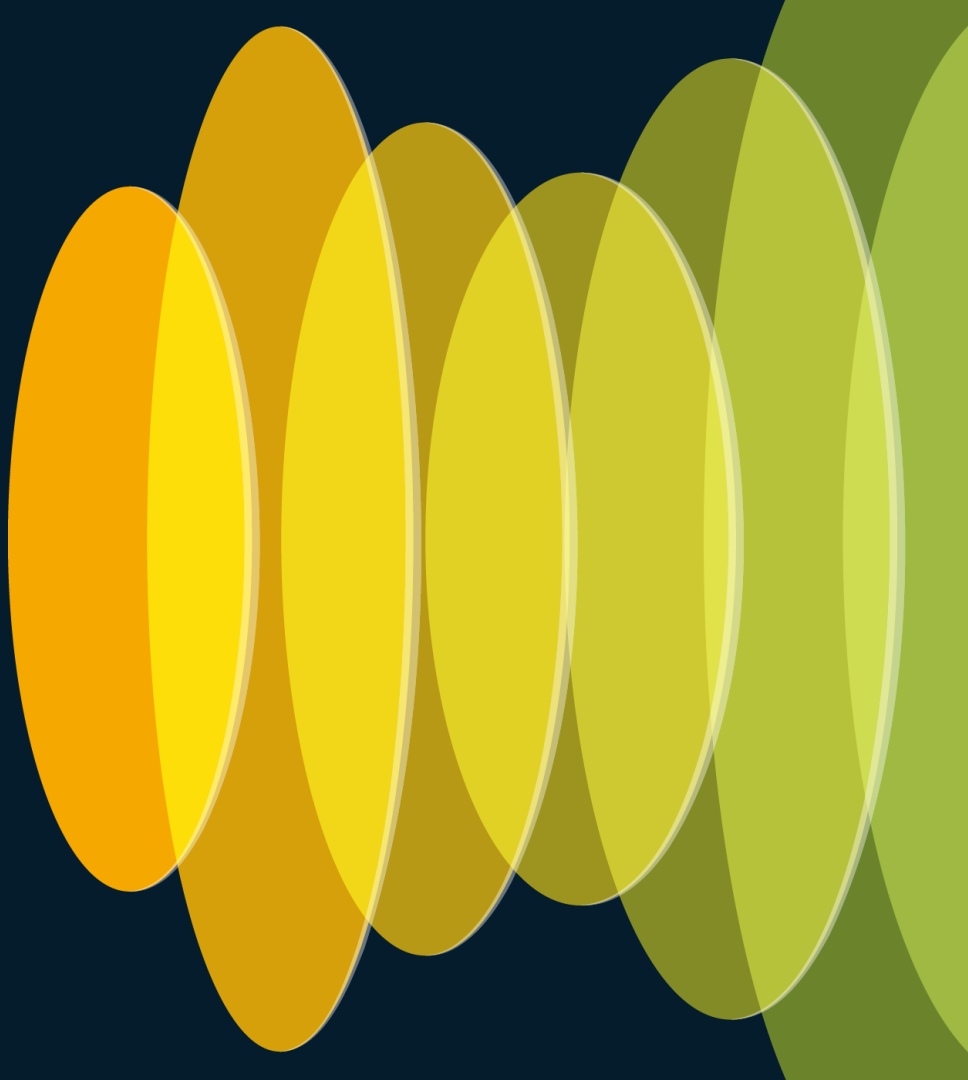
Sustainability outcomes with Splunk and Cisco Intersight



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Splunk OTel support

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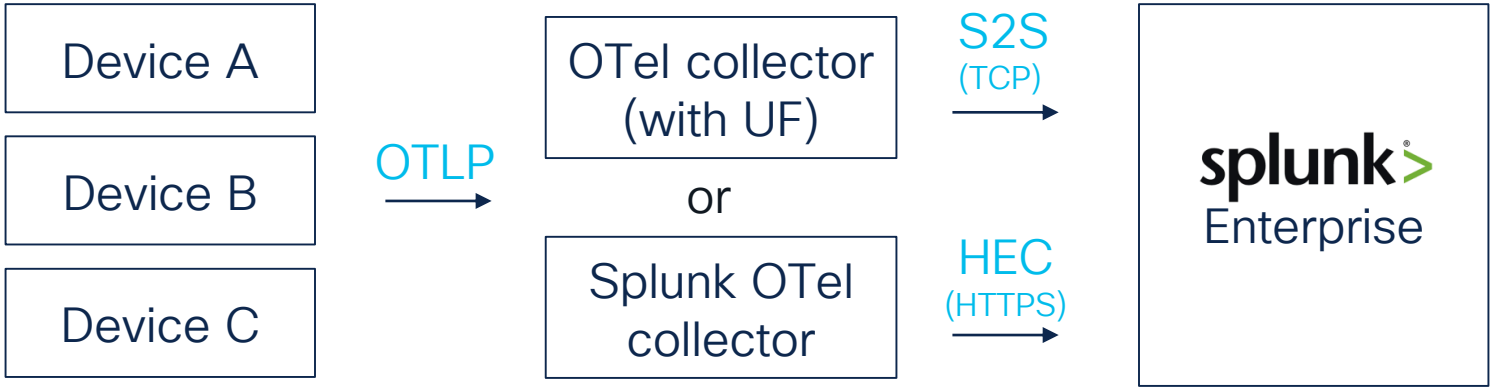
Splunk OTel support



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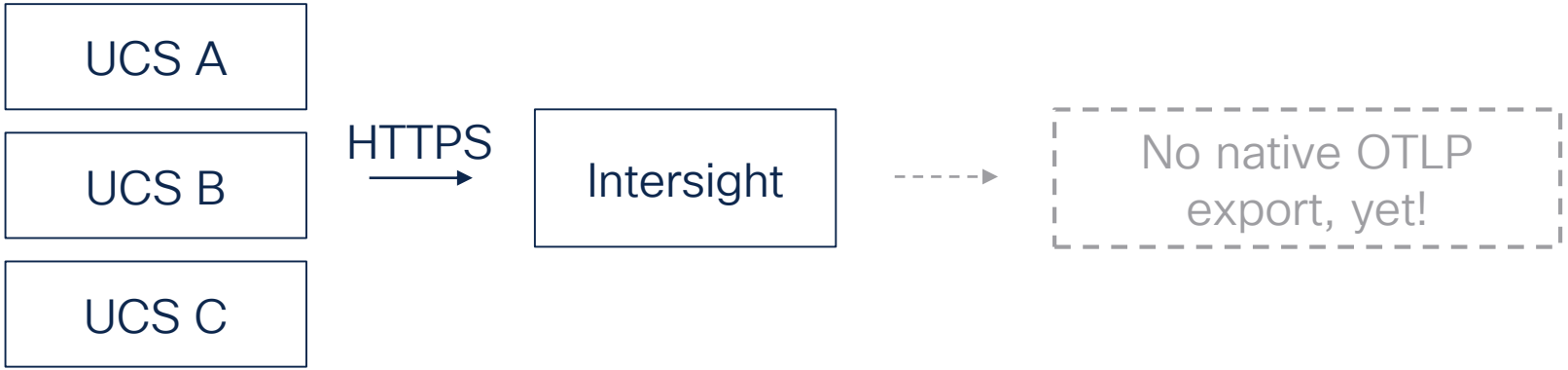
Exporting Intersight with OTLP



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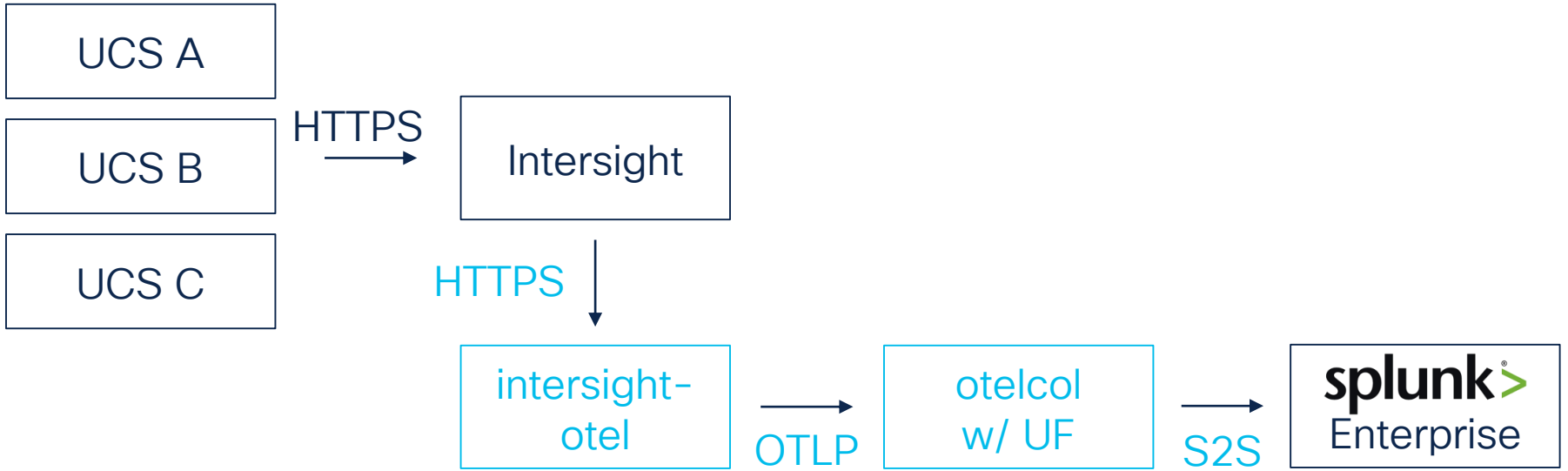
Exporting Intersight with OTLP



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The Splunk Sustainability Toolkit accelerates your ability to manage from sustainability insights.

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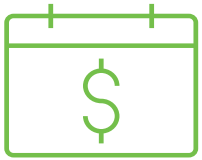
Begin your sustainability journey

Build your data pipeline



Workload Activity Scheduler

Change Workload Location

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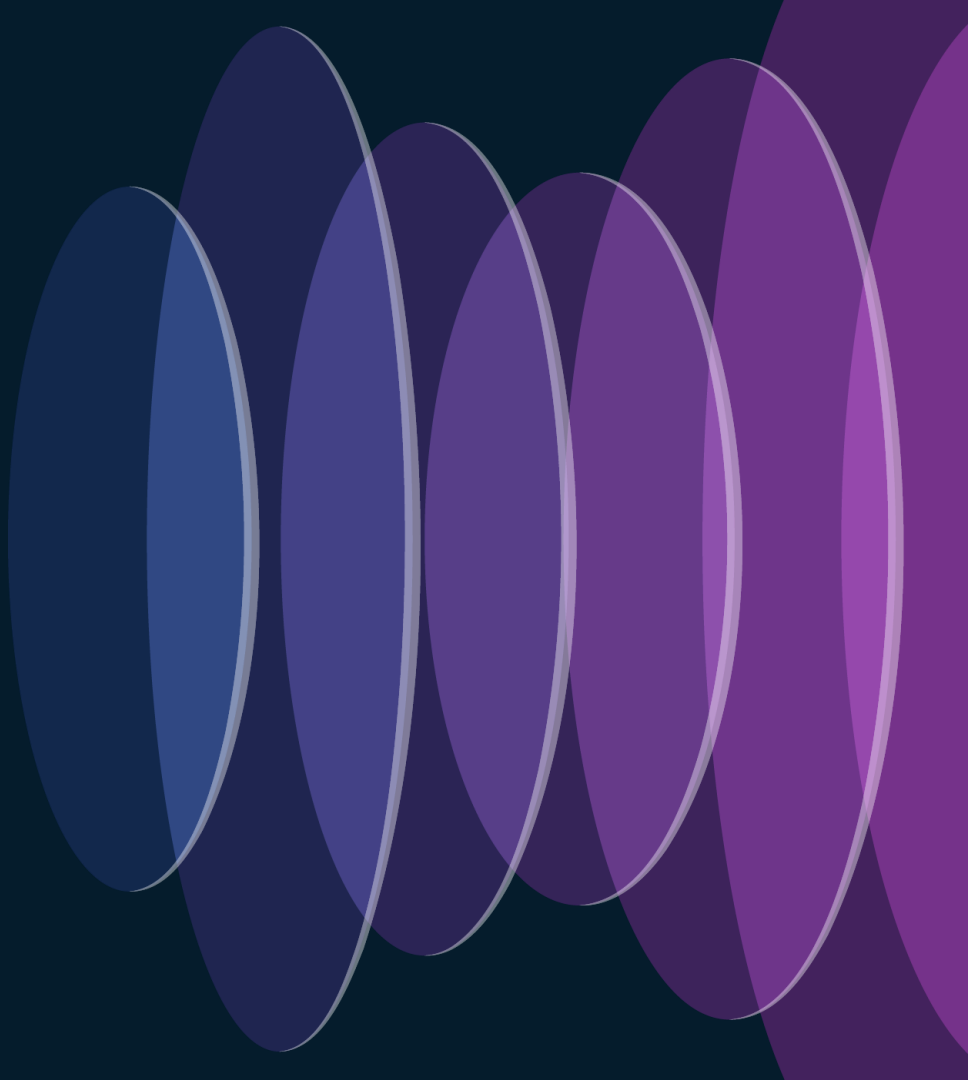
Building your OTel pipeline



Yay, a demo!

View session content on GitHub:
http://cs.co/cl-splunk-sustainability

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What you will see and learn

1. Setting up otel-intersight to forward Intersight data via OTLP
2. Setting up otelcol as a collector and exporter for OTLP traffic

3. Deploying Splunk Sustainability Toolkit
4. Using Workload activity scheduler
5. Using Change workload location

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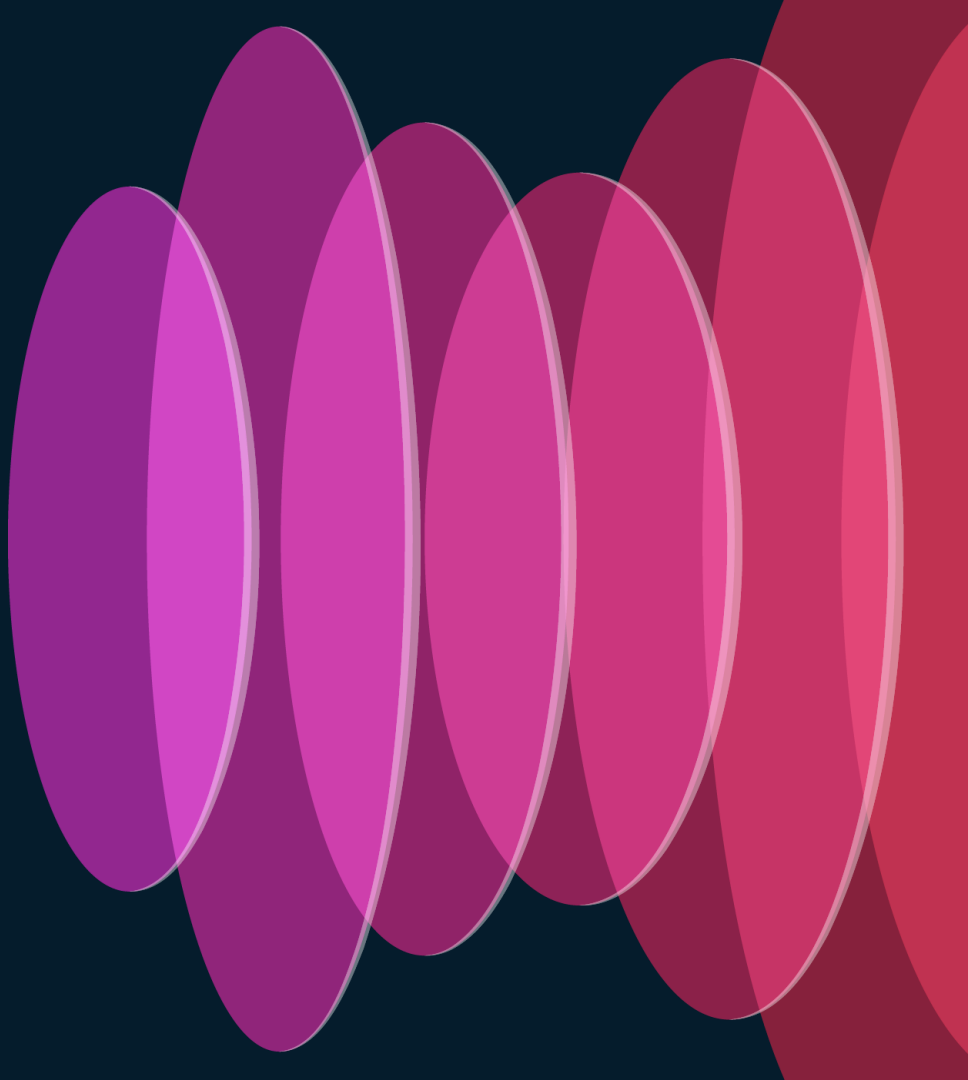
Hands on with the Splunk Sustainability Toolkit



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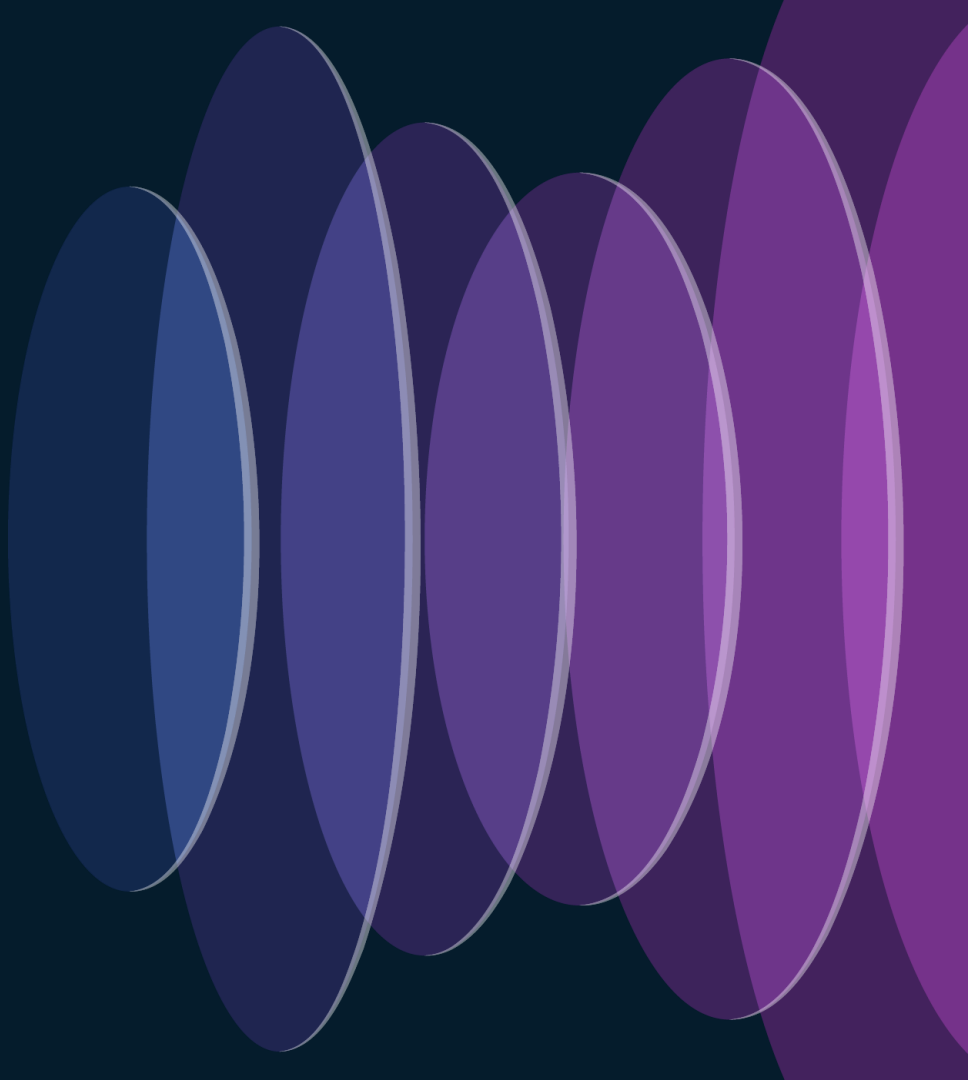
Cisco sustainability outcomes



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[Cisco Product Takeback and Reuse Program]

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[Genuine Cisco Certified Remanufacured Products]

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How we can help

Act on your sustainability goals with advice guided by data, aimed at business outcomes, and led by world-class IT experts

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Plan
Assess your journey, define roadmaps, and plan your goals

Visualize
Monitor your metrics and KPIs with outcomes

Improve
Continuously improve with Insights and Recommendations powered by GenAI

Evolve
Explore sustainability and new network design practices with experts

Powered by: Expertise | AI/ML Insights | Automation | Digital Experiences | Together with our Partners

Available through Cisco Lifecycle Services

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CX Sustainability Insights

Turning data into knowledge

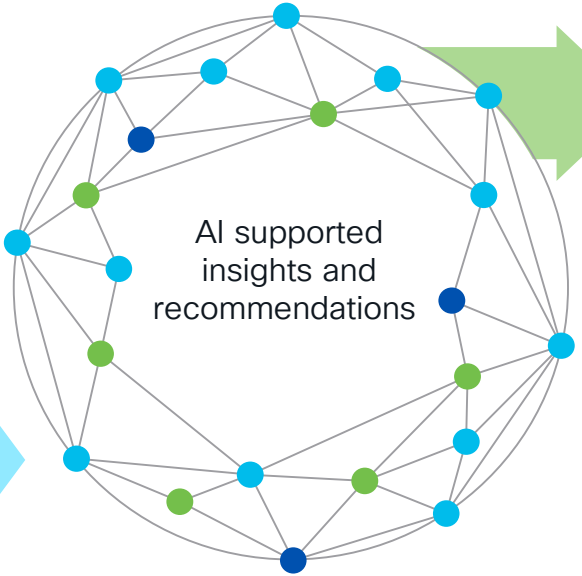
Sustainability Data Foundation

Cisco Energy Management Capability

Device telemetry and controllers

External sources

- Near real-time telemetry with sustainability KPIs
- Data insights
- CX best practices and know-how



- Automated insights
- Recommendations
- Architecture support providing sustainability by design
- Guidance on benefits and business impact
- Visualization and benchmarking

CX Platform

Splunk

Customers, partners and third-party user interface

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What's next?

Interact with experts on Webex:
https://ciscolive.ciscoevents.com/ciscolivebot/#BRKGRN-1022

Visit the Sustainability Services demo station in the CX Booth at the World of Solutions

View session content on GitHub:
http://cs.co/cl-splunk-sustainability

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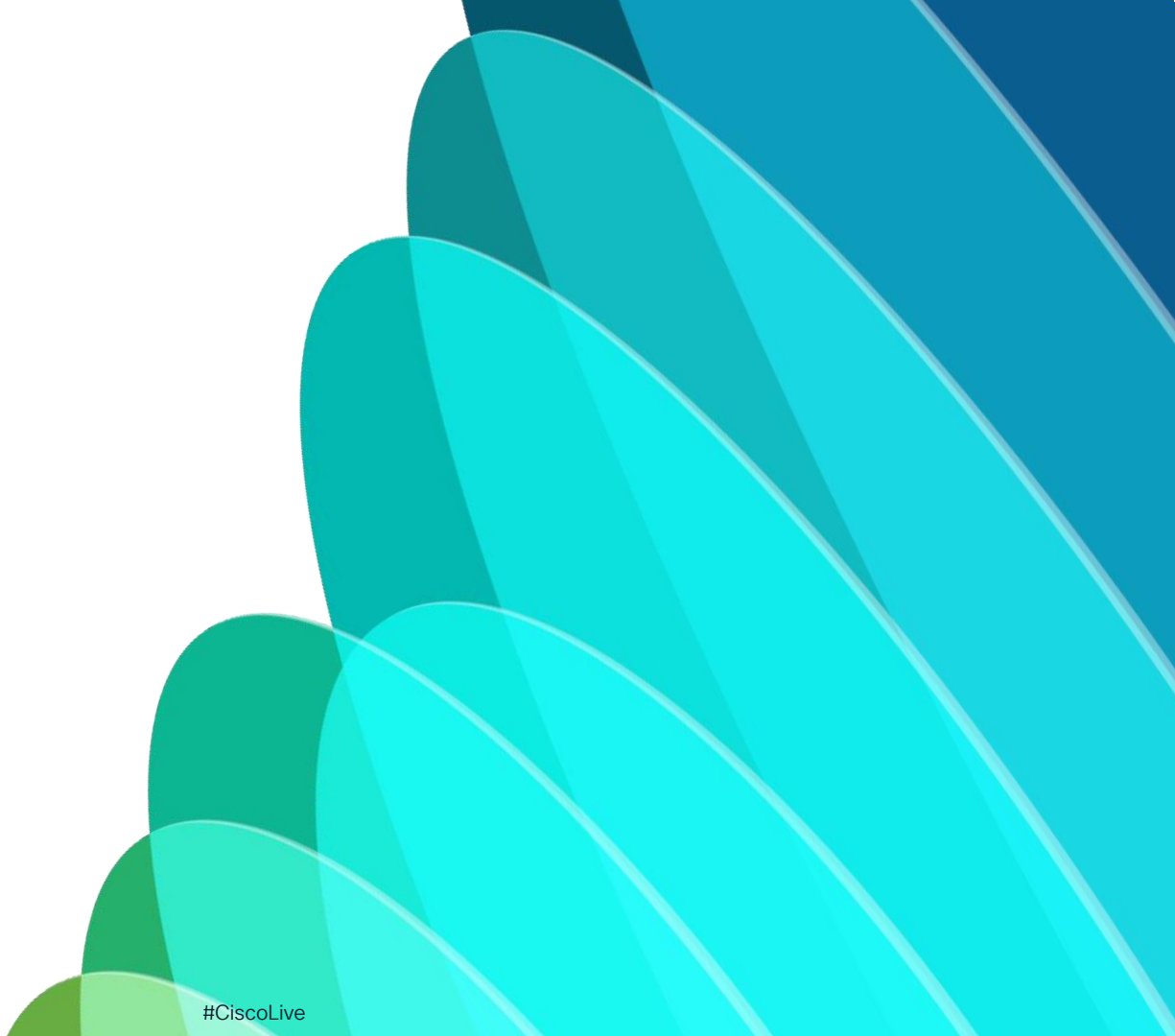
The bridge to possible

Thank you



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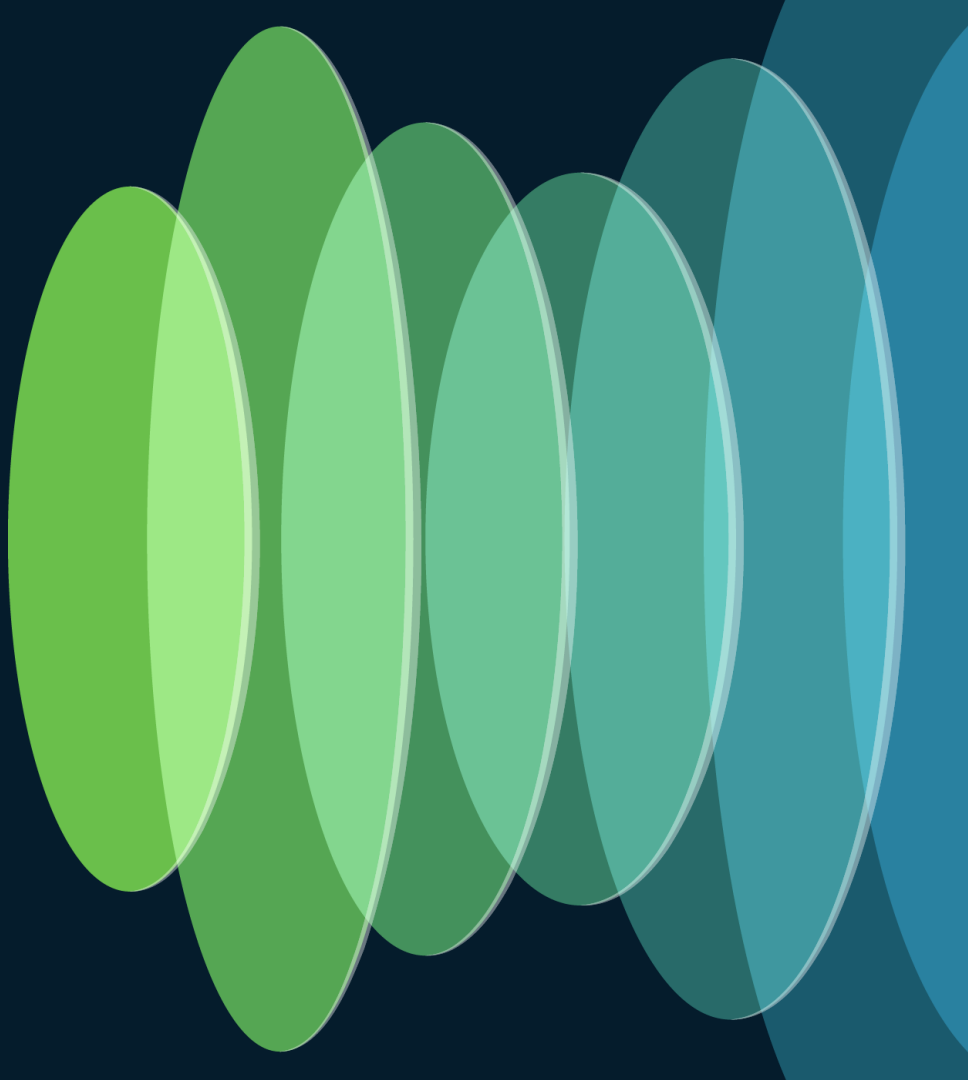
Offline Demo



Starting OpenTelemetry collector (otelcol)

```
(base) sholl@SHOLL-M-T0L6 CLUS24-otel-sustainability % ./otelcol --config=cfg/otelcol.yaml
2024-06-01T12:58:25.763-0400    info    service@v0.98.0/telemetry.go:55 Setting up own telemetry...
2024-06-01T12:58:25.764-0400    info    service@v0.98.0/telemetry.go:97 Serving metrics {"address": ":8888", "level": "Basic"}
2024-06-01T12:58:25.767-0400    info    service@v0.98.0/service.go:143  Starting otelcol...     {"Version": "0.98.0", "NumCPU": 12}
2024-06-01T12:58:25.767-0400    info    extensions/extensions.go:34     Starting extensions...
2024-06-01T12:58:25.767-0400    info    extensions/extensions.go:37     Extension is starting...        {"kind": "extension", "name": "zpages"}
2024-06-01T12:58:25.767-0400    info    zpagesextension@v0.98.0/zpagesextension.go:53   Registered zPages span processor on tracer provider {"kind": "extension", "name"
: "zpages"}
2024-06-01T12:58:25.767-0400    info    zpagesextension@v0.98.0/zpagesextension.go:63   Registered Host's zPages        {"kind": "extension", "name": "zpages"}
2024-06-01T12:58:25.768-0400    info    zpagesextension@v0.98.0/zpagesextension.go:75   Starting zPages extension       {"kind": "extension", "name": "zpages", "config"
: {"TCPAddr":{"Endpoint":"localhost:55679","DialerConfig":{"Timeout":0}}}}
2024-06-01T12:58:25.768-0400    info    extensions/extensions.go:52     Extension started.      {"kind": "extension", "name": "zpages"}
2024-06-01T12:58:25.768-0400    info    extensions/extensions.go:37     Extension is starting...        {"kind": "extension", "name": "pprof"}
2024-06-01T12:58:25.769-0400    info    pprofextension@v0.98.0/pprofextension.go:60     Starting net/http/pprof server  {"kind": "extension", "name": "pprof", "config":
 {"TCPAddr":{"Endpoint":"localhost:1777","DialerConfig":{"Timeout":0}},"BlockProfileFraction":0,"MutexProfileFraction":0,"SaveToFile":""}}
2024-06-01T12:58:25.769-0400    info    extensions/extensions.go:52     Extension started.      {"kind": "extension", "name": "pprof"}
2024-06-01T12:58:25.769-0400    info    extensions/extensions.go:37     Extension is starting...        {"kind": "extension", "name": "health_check"}
2024-06-01T12:58:25.769-0400    info    healthcheckextension@v0.98.0/healthcheckextension.go:35 Starting health_check extension     {"kind": "extension", "name": "healt
h_check", "config": {"Endpoint":"0.0.0.0:13133","TLSSetting":null,"CORS":null,"Auth":null,"MaxRequestBodySize":0,"IncludeMetadata":false,"ResponseHeaders":null,"Path":"
/","ResponseBody":null,"CheckCollectorPipeline":{"Enabled":false,"Interval":"5m","ExporterFailureThreshold":5}}}
2024-06-01T12:58:25.769-0400    warn    internal@v0.98.0/warning.go:42  Using the 0.0.0.0 address exposes this server to every network interface, which may facilitate D
enial of Service attacks. Enable the feature gate to change the default and remove this warning.        {"kind": "extension", "name": "health_check", "documentation": "
https://github.com/open-telemetry/opentelemetry-collector/blob/main/docs/security-best-practices.md#safeguards-against-denial-of-service-attacks", "feature gate ID": "c
omponent.UseLocalHostAsDefaultHost"}
2024-06-01T12:58:25.769-0400    info    extensions/extensions.go:52     Extension started.      {"kind": "extension", "name": "health_check"}
2024-06-01T12:58:25.772-0400    warn    internal@v0.98.0/warning.go:42  Using the 0.0.0.0 address exposes this server to every network interface, which may facilitate D
enial of Service attacks. Enable the feature gate to change the default and remove this warning.        {"kind": "receiver", "name": "otlp", "data_type": "traces", "doc
umentation": "https://github.com/open-telemetry/opentelemetry-collector/blob/main/docs/security-best-practices.md#safeguards-against-denial-of-service-attacks", "featur
e gate ID": "component.UseLocalHostAsDefaultHost"}
2024-06-01T12:58:25.773-0400    info    otlpreceiver@v0.98.0/otlp.go:102        Starting GRPC server    {"kind": "receiver", "name": "otlp", "data_type": "traces", "end
point": "0.0.0.0:4317"}
2024-06-01T12:58:25.773-0400    warn    internal@v0.98.0/warning.go:42  Using the 0.0.0.0 address exposes this server to every network interface, which may facilitate D
enial of Service attacks. Enable the feature gate to change the default and remove this warning.        {"kind": "receiver", "name": "otlp", "data_type": "traces", "doc
umentation": "https://github.com/open-telemetry/opentelemetry-collector/blob/main/docs/security-best-practices.md#safeguards-against-denial-of-service-attacks", "featur
e gate ID": "component.UseLocalHostAsDefaultHost"}
2024-06-01T12:58:25.773-0400    info    otlpreceiver@v0.98.0/otlp.go:152        Starting HTTP server    {"kind": "receiver", "name": "otlp", "data_type": "traces", "end
point": "0.0.0.0:4318"}
2024-06-01T12:58:25.774-0400    info    healthcheck/handler.go:132      Health Check state change       {"kind": "extension", "name": "health_check", "status": "ready"}
2024-06-01T12:58:25.774-0400    info    service@v0.98.0/service.go:169  Everything is ready. Begin running and processing data.
2024-06-01T12:58:25.774-0400    warn    localhostgate/featuregate.go:63 The default endpoints for all servers in components will change to use localhost instead of 0.0.
0.0 in a future version. Use the feature gate to preview the new default.   {"feature gate ID": "component.UseLocalHostAsDefaultHost"}
```

Config writes to file data/otel-export.jsonl, which can be modified as desired.

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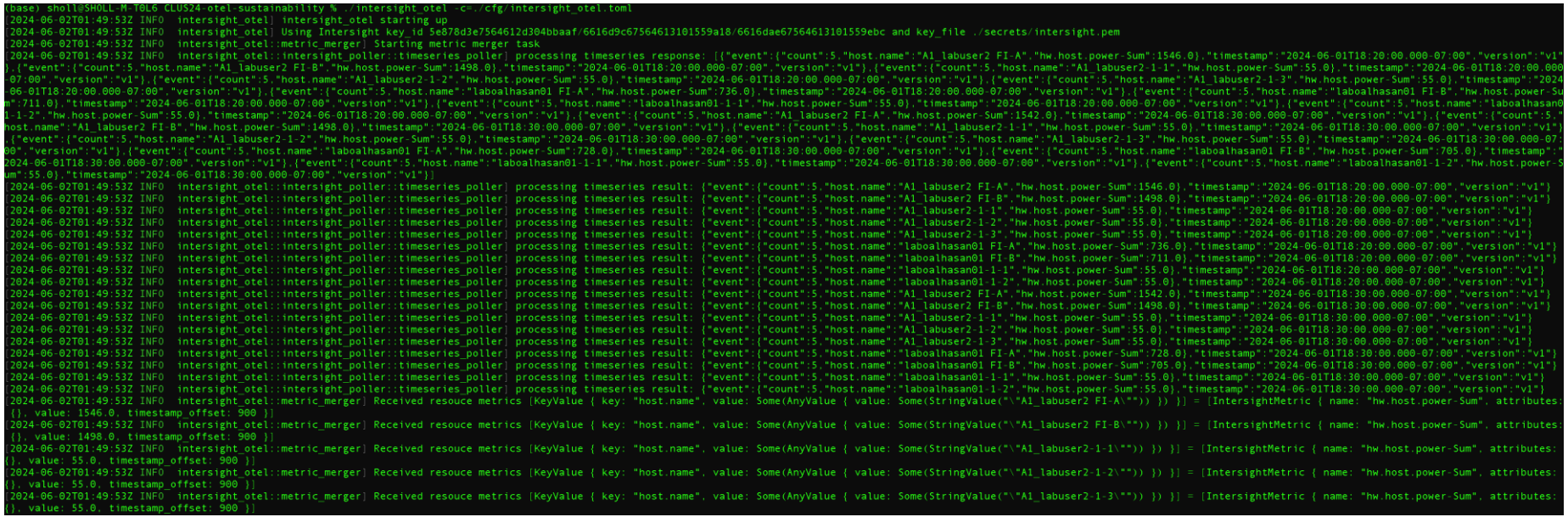
Starting intersight_otel



You will need to edit the config:

- To have your Intersight API information
- To edit the destination for OTLP data to send to. Sample config assumes otelcol is running on the same box and default port.

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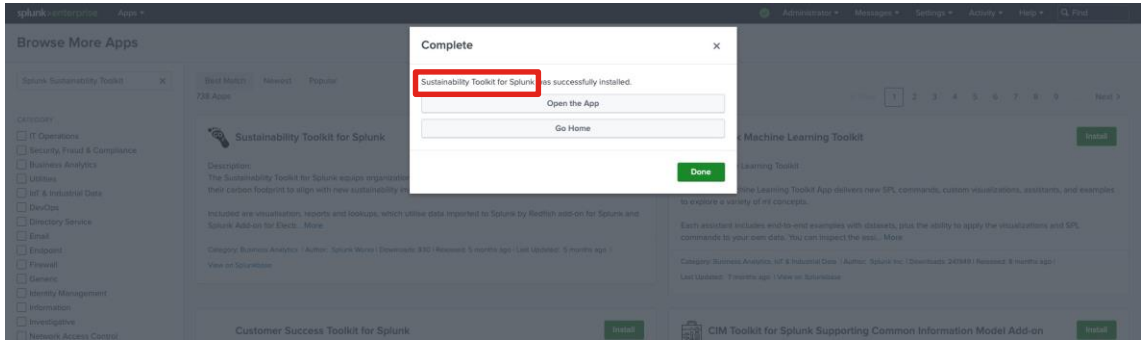
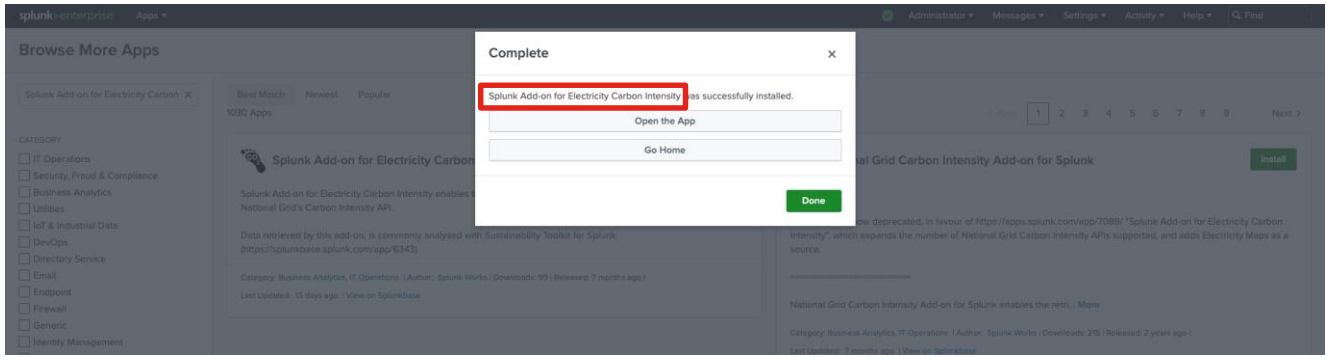
Install Splunk Apps



Sustainability Toolkit ships with canned dashboards to visually represent sustainability metrics & outcomes

Splunk Add-on for Electricity Carbon Intensity will bring in electricitymaps.com data into Splunk



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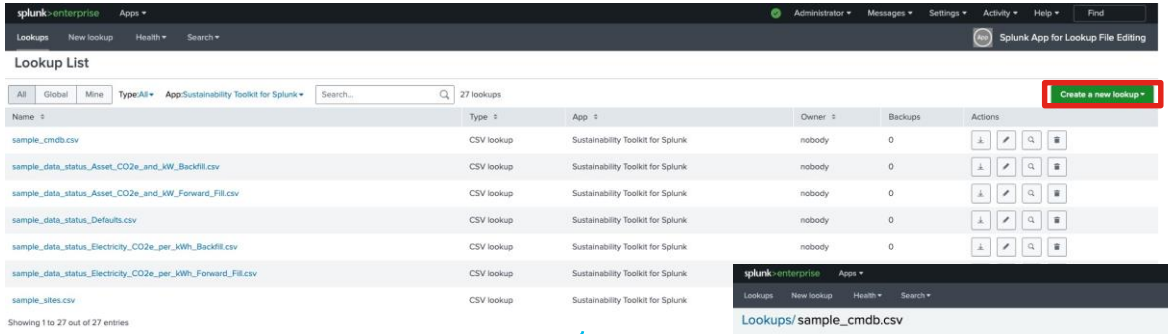
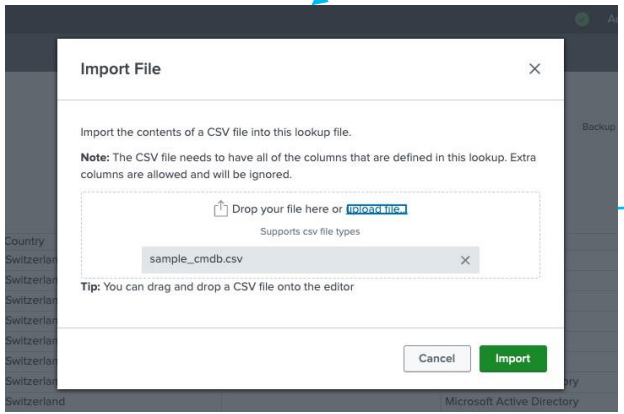
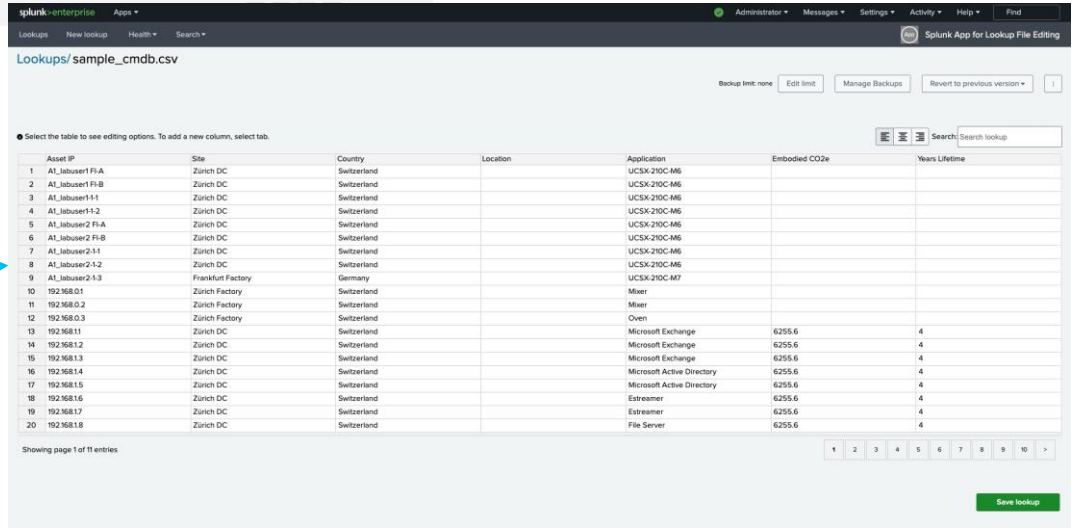
Create Lookups for CMDB & Sites







Create asset & site inventory within Splunk to cross-reference with OpenTelemetry data

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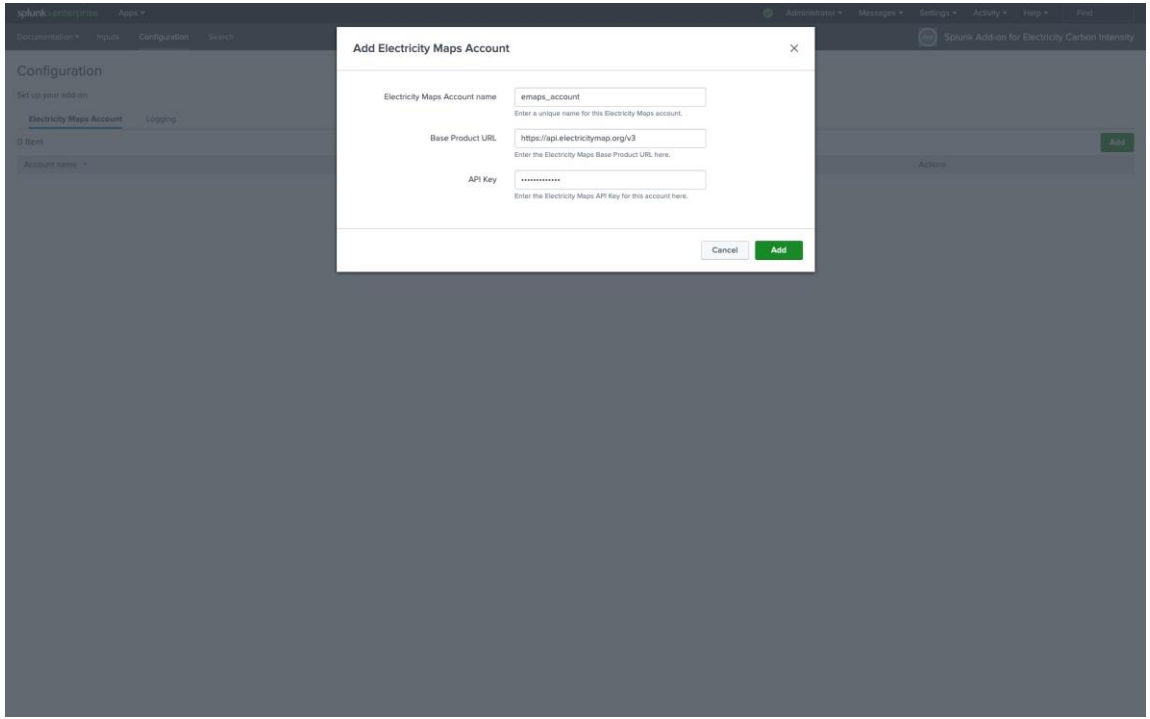
Configure Electricity Maps API Account



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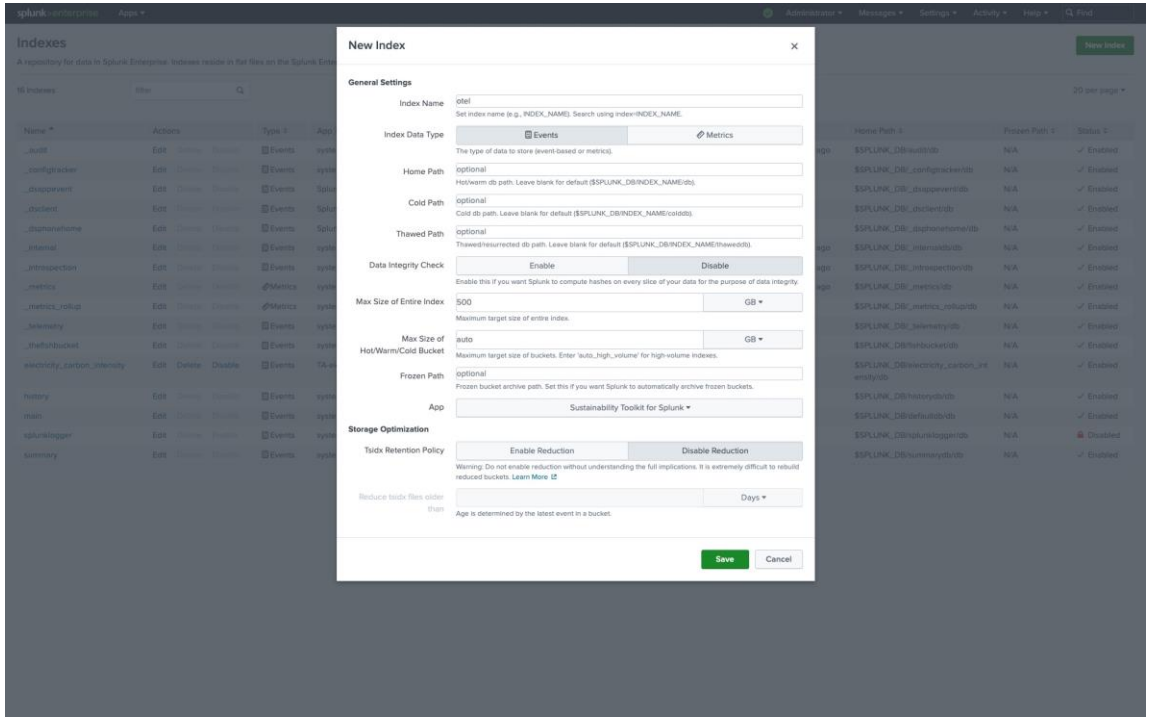
Create new index for OpenTelemetry Data



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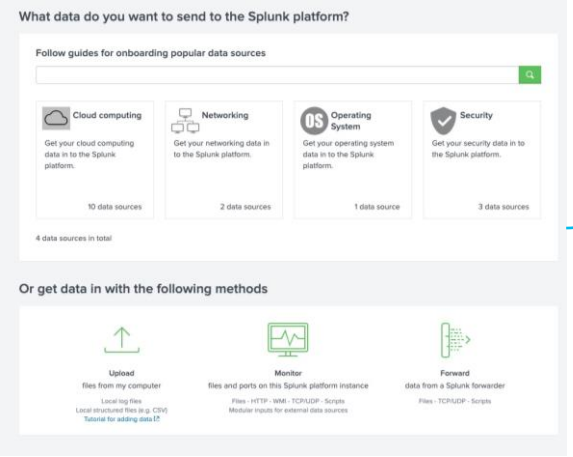
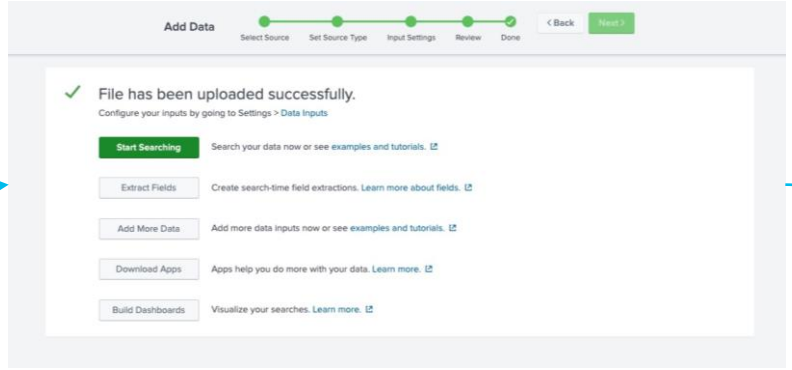
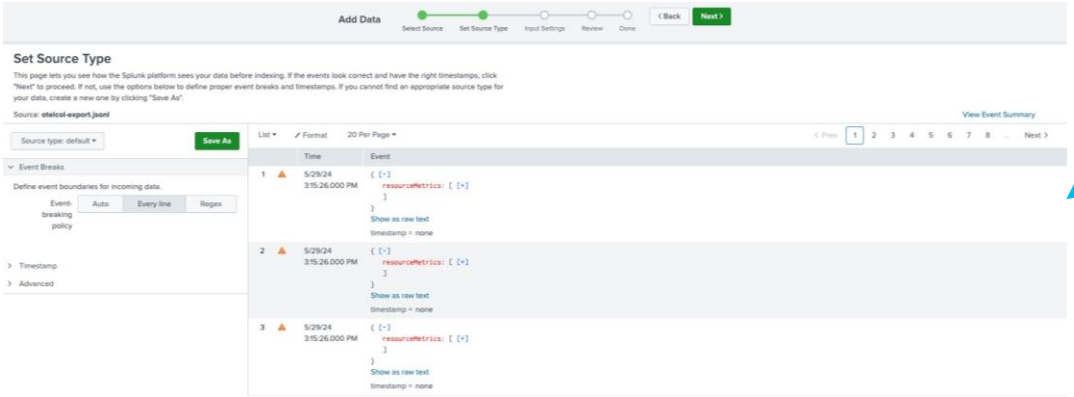
Upload Data to index (demo only)







Example shows manually uploading a file with lab data. In production, you may want to setup “Monitor” or “Forward” to ingest data.

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Run otel-sst-quickstart.py

```
python3 otel-sst-quickstart.py

Enter your splunk IP or hostname: 10.122.139.24
Enter your Splunk management port (usually 8089): 8089
Enter your Splunk username: admin
Enter your Splunk password:
Info: Authenticated successfully to Splunk.
App 'Sustainability_Toolkit' is installed.
App 'TA-electricity-carbon-intensity' is installed.
Info: Authenticated successfully to Splunk.
The index 'otel' already exists.
The index 'electricity_carbon_intensity' already exists.
The index 'sustainability_toolkit_summary_asset_metrics' already exists.
The index 'sustainability_toolkit_summary_electricity_metrics' already exists.
Switching to the carbon intensity app context.
Info: Authenticated successfully to Splunk.

***ACTION REQUIRED***
 Please navigate to this URL, click Add, and provision your electrictymaps API account, then return back here:
http(s)://10.122.139.24:8000/en-US/app/TA-electricity-carbon-intensity/configuration

Use the following information:
 Electricity Maps Account name: electricitymaps
 Base Product URL: https://api.electricitymap.org/v3
 API Key: [your API key]

Once you complete this step return to this window and hit enter to proceed with the automation:
Do you already know the name of your electricitymaps zones? If not, we can show you the options here by saying no (y/n):y
Enter the electricitymaps zones you want to collect data from, in a comma separated format. See above for the full list of zones (e.g. CH,DE,US-CAR-DUK,US-CAL-LDWP): CH,DE,US-CAR-DUK,US-CAL-LDWP
Configuration parameters updated successfully for inputs.
Switching back to the Sustainability Toolkit app context
Info: Authenticated successfully to Splunk.
Search macro power-otel has been created.
Search macro power-asset-location-old has been created.
Search macro power-asset-location has been created.
Search macro electricity-carbon-intensity-for-assets-old has been created.
Search macro electricity-carbon-intensity-for-assets has been created.
Saved search 'Summarize Asset CO2e & kW V1.0' updated successfully.
Saved search 'Summarize Electricity CO2e/kWh V1.0' updated successfully.
```

Script adjusts Sustainability Toolkit Search Macros & Saved Searches to work with OpenTelemetry Data.

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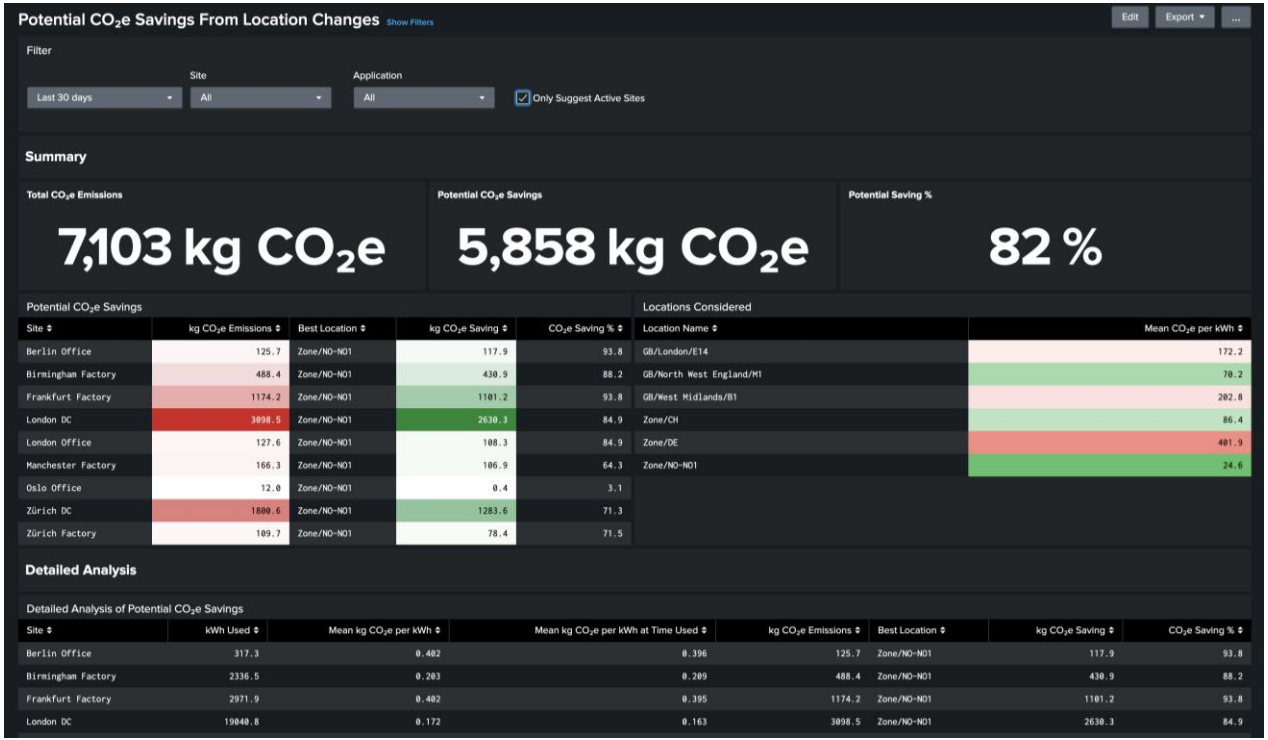
Sustainability Toolkit with OpenTelemetry data



Potential CO_2e Savings From Location Changes

Show Filters | Edit | Export | ...

Filter

Site: All | Application: All | Last 30 days | Only Suggest Active Sites

Summary

Total CO_2e Emissions	Potential CO_2e Savings	Potential Saving %
7,103 kg CO_2e	5,858 kg CO_2e	82 %

Potential CO_2e Savings

Site	kg CO_2e Emissions	Best Location	kg CO_2e Saving	CO_2e Saving %
Berlin Office	125.7	Zone/NO-NO1	117.9	93.8
Birmingham Factory	488.4	Zone/NO-NO1	430.9	88.2
Frankfurt Factory	1174.2	Zone/NO-NO1	1101.2	93.8
London DC	3098.5	Zone/NO-NO1	2630.3	84.9
London Office	127.6	Zone/NO-NO1	108.3	84.9
Manchester Factory	166.3	Zone/NO-NO1	106.9	64.3
Oslo Office	12.0	Zone/NO-NO1	0.4	3.1
Zürich DC	1800.6	Zone/NO-NO1	1283.6	71.3
Zürich Factory	109.7	Zone/NO-NO1	78.4	71.5

Locations Considered

Location Name	Mean CO_2e per kWh
GB/London/E14	172.2
GB/North West England/M1	70.2
GB/West Midlands/B1	202.8
Zone/CH	86.4
Zone/DE	401.9
Zone/NO-NO1	24.6

Detailed Analysis

Detailed Analysis of Potential CO_2e Savings

Site	kWh Used	Mean kg CO_2e per kWh	Mean kg CO_2e per kWh at Time Used	kg CO_2e Emissions	Best Location	kg CO_2e Saving	CO_2e Saving %
Berlin Office	317.3	0.402	0.396	125.7	Zone/NO-NO1	117.9	93.8
Birmingham Factory	2336.5	0.203	0.209	488.4	Zone/NO-NO1	430.9	88.2
Frankfurt Factory	2971.9	0.402	0.395	1174.2	Zone/NO-NO1	1101.2	93.8
London DC	19040.8	0.172	0.163	3098.5	Zone/NO-NO1	2630.3	84.9

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