Search on Splunk Cloud Platform

Intro to SPLv2, the module system, and the catalog

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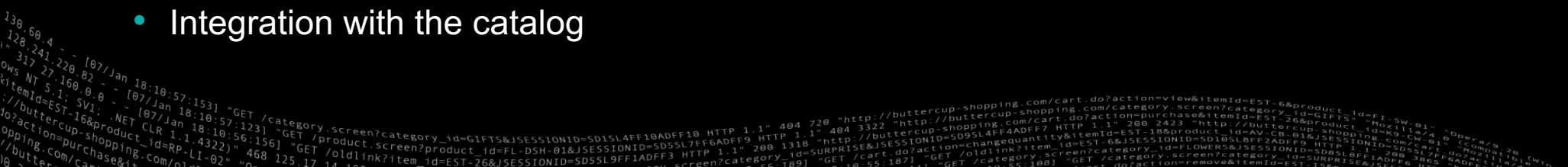
Agenda

- The big picture
  - End to end
  - Architecture
  - Comparing SSC to SplunkD
- Catalog
  - Datasets
  - Rules
- Data Organization
  - Modules
  - Imports
- Spl v2
  - Goals
  - Supported commands
- Search service
  - Running searches
  - Integration with the catalog



End to End

What do you need to do to run a search?

1 → 2 → 3 → 4

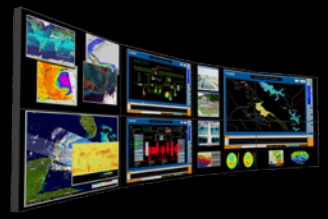
Create index

- Create **index** in **catalog**
- *Route data to index using ingest API*

Create rules & actions

- Create **rules** in **catalog** to enrich sourcetypes to run Regex, Alias, Calc. fields, etc.

Dispatch search



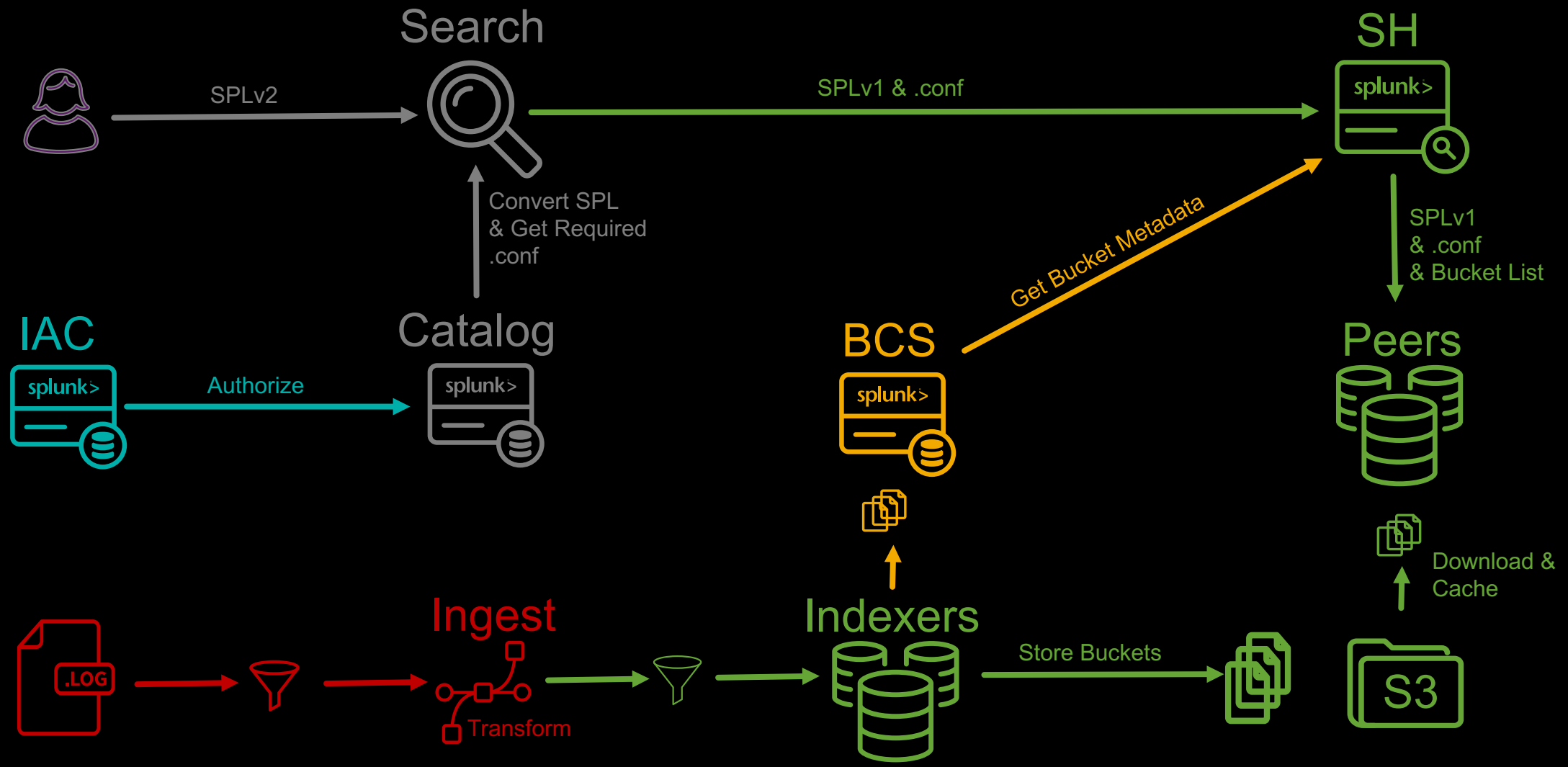
- Dispatch **SPL v2 search** via **Search Service** API call
- Kicks off search in **SplunkD**

Download results

- Query **Search Service** or **Catalog** for job status
- Use **Search Service** to download results

Search Architecture

Architecture Diagram from the Search Perspective



What's Different?

Splunk Enterprise

- Search via embedded Web UI or REST API
- Traditional SPL
- Conf Files
  - Define Indexes, Lookups, Props
- Search & indexing are co-located
- Buckets stored on Indexers
- SplunkD responsible for enforcing Security

SSC

- Search via Search Service or SDK/Apps that use Search Service
- Simplified SPL (v2)
- Catalog
  - Define Datasets and Rules/Actions
- Separated search & indexing
- Buckets stored in S3 and cached
- Catalog and Search Service responsible for enforcing Security

Catalog

Introduction to the new Catalog Service

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Catalog

What is the Catalog? What does it store?

- ***The*** source of truth:
  - A REST service that stores metadata about all datasets and rules in Splunk
  - Apps can share metadata via the Catalog
  - Continuously and dynamically updated as Splunk is used
- Datasets are named objects containing data that you can interact with in SPL
  - Examples: indexes, jobs, views, metric indexes, lookups, kvcollections, etc.
  - Dataset metadata stored in the catalog includes:
    - Properties: name, module, kind, owner, createdDate, etc.
    - Type-specific properties: spl for a view, retentionPeriod for an index, etc.
    - Known fields in a dataset
- Rules group a collection of search time enrichments for a SourceType
- Will eventually store relationship metadata and annotations too

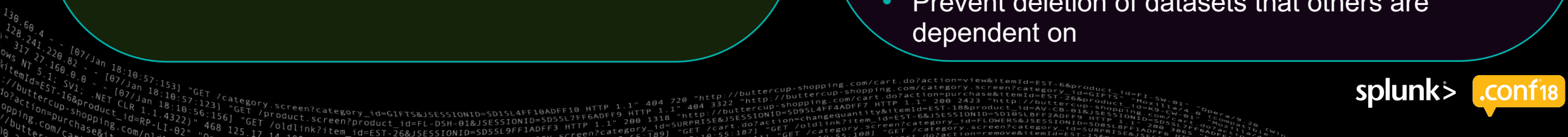
Catalog's Use Cases

Current

- Knowledge object management
  - Indexes, Metrics, Views, KVCollections, Lookups, etc.
- Search history
  - Keep track of all searches run to-date, allows for faster reuse
- Data Discovery
  - Find Data of interest, datasets with specific fields etc.

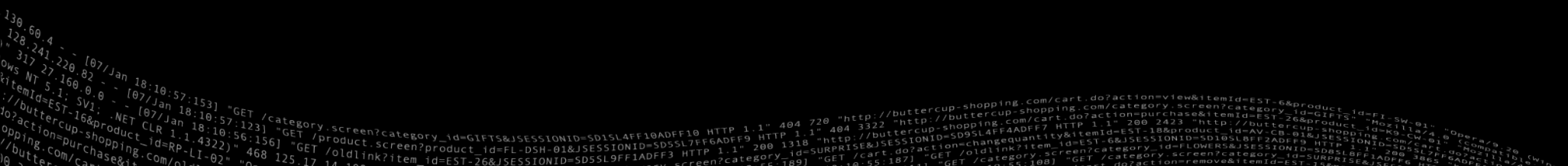
Future

- Read/write metrics catalog
  - Annotate information about metric series
- Cost based optimization
  - e.g optimal order to perform joins
- Recommendations
  - For datasets, across customers
- Data normalization
  - Mapping and publishing of datasets for customers
- Data lineage
  - Annotations that track where fields come from
- Data dependencies
  - Prevent deletion of datasets that others are dependent on



Catalog: Dataset related APIs

- **/<tenant>/catalog/v1/datasets**
  - GET → retrieve information about datasets
  - POST → create a new dataset
- **/<tenant>/catalog/v1/datasets/<resource-name>**
  - GET → retrieve a specific dataset by **dataset-id** or **resource-name**
  - PATCH → update the specific dataset
  - DELETE → delete a specific dataset
- **/<tenant>/catalog/v1/datasets/<resource-name>/fields**
  - GET → retrieve known fields in a specific dataset
  - POST → create (or record the presence of) a new field in a dataset
- **/<tenant>/catalog/v1/datasets/<resource-name>/fields/<name>**
  - GET → retrieve a field in a specific dataset by id or name
  - PATCH → update the specified field
  - DELETE → remove (or delete the record of) the specified field



Catalog

Creating an Index Dataset

POST ~/<tenant>/catalog/v1/datasets
Content-Type: application/json
Accept: application/json
Authorization: <bearerTokenFor(ajames@splunk.com)>

```
{
    "name": "foo",
    "kind": "index",
    "module": "mymodule",
    "disabled": false,
    "frozenTimePeriodInSecs": 188697600,
    "owner": "ajames@splunk.com"
}
```

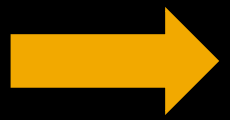
Status: 201 Created
Content-Type: application/json
ContentLength: XXX
Location: /mymodule.foo

```
{
    "name": "foo",
    "kind": "index",
    "module": "mymodule",
    "disabled": false,
    "frozenTimePeriodInSecs": 188697600,
    "owner": "ajames@splunk.com",
    "created": "2018-07-19 06:33:24.000824",
    "modified": "2018-07-19 06:33:24.000824",
    "version": 1,
    "id": "5b50d9740db35a77d54bf32e",
    "createdby": "ajames@splunk.com",
    "modifiedby": "ajames@splunk.com",
    "resourcename": "mymodule.foo",
    "internalname": "mymodule_____foo"
}
```

Catalog: Creating a Field in a Dataset

Example: adding a city field to the foo dataset in mymodule

```
POST ~/<tenant>/catalog/v1/datasets/mymodule.foo/fields
Content-Type: application/json
Accept: application/json
Authorization: <bearerTokenForAJames@splunk.com>
X-Request-ID: <assignedByGatewayService>

{
    "name": "city",
}
```



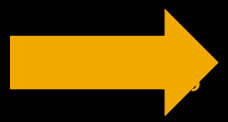
```
Status: 201 Created
Content-Type: application/json
ContentLength: XXX
Location: /city

{
    "name": "city",
    "id": "5b500000db3da700000000",
    "datasetId": "5b50d9740db35a77d54bf32e",
    "dataType": "STRING",
    "fieldType": "UNKNOWN",
    "prevalence": "UNKNOWN",
    "created": " 2018-07-19 06:35:40.000243",
    "modified": "2018-07-19 06:35:40.000243",
    "versionAdded": 2,
    "versionRemoved": null
}
```

Rules and Actions

What are rules and actions?

- **Rules** group **Actions** (or search time enrichments) associated with a SourceType
- **Rules** replace Props.conf

```
[sourcetype::webaccess]
FIELDALIAS-user = uid as user
EXTRACT-errors = device_id=\[w+\](?<err_code>[^:]+)
EVAL-company = collasce(company, "unknown")
LOOKUP-product_info = products ID AS pid \
       OUTPUT Name AS product_name
KV_MODE = auto
```



```
{
    "id": #id#,
    "name": #name#,
    "module": #module#,
    "match": "sourcetype::webaccess",
    "owner": "user”,
    "actions": [
        {
            "id": #id#,
            "kind": "ALIAS",
            "field": "uid",
            "alias": "user”
        },
        {
            "id": #id#,
            "kind": "REGEX",
            "pattern": "device_id=\[w+\](?<err_code>[^:]+)",
            "field": "foo",
            "limit": ?,
            "format": ?,
        }
    ]
}
```

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Catalog: Rule related APIs

- **/<tenant>/catalog/v1/rules**
  - GET → retrieve information about rules
  - POST → create a new rule
- **/<tenant>/catalog/v1/rules/<rule-id>**
  - GET → retrieve a specific rule by **rule-id**
  - PATCH → update the specific rule
  - DELETE → delete a specific rule
- **/<tenant>/catalog/v1/rules/<rule-id>/actions**
  - GET → retrieve the actions in the specified rule
  - POST → create a new action in the specified rule
- **/<tenant>/catalog/v1/rules/<rule-id>/actions/<action-id>**
  - GET → retrieve the specific action
  - PATCH → update the specified action
  - DELETE → remove the specified action

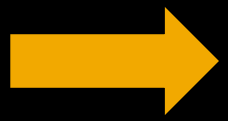
- ***NOTE:*** *we will also support using a <rule-resourceName> in place of <rule-id> above.*

Catalog: Creating a Rule and nested Action(s)

Example: creating the webaccess rule in mymodule with a nested REGEX action

```
POST ~/<tenant>/catalog/v1/rules
Content-Type: application/json
Accept: application/json
Authorization: <bearerTokenForAJames@splunk.com>
X-Request-ID: <assignedByGatewayService>

{
    "name":"webaccess",
    "module":"mymodule",
    "owner": "ajames@splunk.com",
    "match": "sourcetype::webaccess",
    "actions": [{
        "owner": "ajames@splunk.com",
        "kind": "REGEX",
        "pattern": "[A-Za-z0-9_]+",
        "field": "name"
    }]
}
```



```
Status: 201 Created
Content-Type: application/json
ContentLength: XXX

{
    "name": "webaccess",
    "module": "mymodule",
    "match": "sourcetype::webaccess",
    "owner": "ajames@splunk.com",
    "resourcename": "mymodule.webaccess",
    "created": "2018-07-27 09:14:20.000841",
    "modified": "2018-07-27 09:14:20.000841",
    "version": 1,
    "id": "5b5b8b2c2c0c004d43b14138",
    "createdby": "ajames@splunk.com",
    "modifiedby": "ajames@splunk.com",
    "actions": [{
        "kind": "REGEX",
        "pattern": "[A-Za-z0-9_]+",
        "field": "name",
        "owner": "ajames@splunk.com",
        "created": "2018-07-27 09:14:20.000841",
        "modified": "2018-07-27 09:14:20.000841",
        "version": 1,
        "id": "5b5b8b2c2c0c004d43b14139",
        "createdby": "ajames@splunk.com",
        "modifiedby": "ajames@splunk.com"
```

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Modules and Imports

Data Organization

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Example Search

mymodule

```
| from main where user="fred"
| stats count() by host
```

Search Service

Catalog Service

catalog

commons-ast

mymodule

- main
- metrics
- users-col
- threats-col
- users (references user-col)
- threats (references threats-col)

X=sourcetype:foo

AL R A C

v1

```
| search index="mymodule_____main" user=CASE("fred")
| stat count by host
```

mymodule ∩ permissions ∩ spl

```
{ needed conf JSON }
```

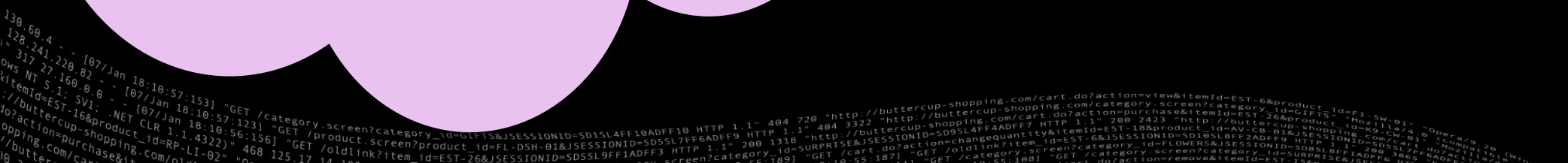
Search Head

conf in Memory

peer1

peer2

peer3



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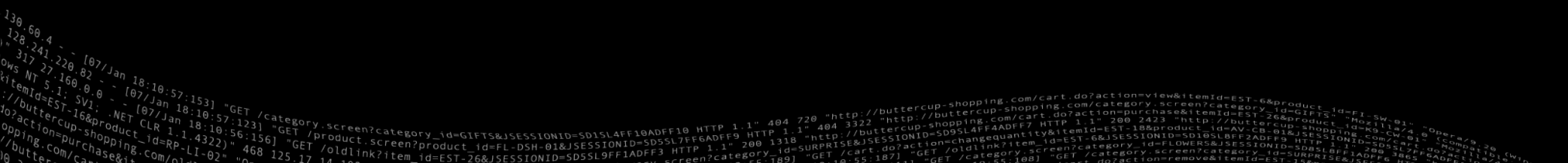
Modules

What is the module thing? And how is it used?

- **Datasets** and **Rules** are organized into **Modules** in the **Catalog**.
  - Every Dataset or Rule has a name and module
  - The concatenation of module + "." + name is a resourceName, it's unique within a tenant
- **Datasets**
  - Datasets are currently referenced by name (not resourceName) in SPL v2
  - Searches are run in the context of a module. Datasets within the search are resolved by their resourceName
  - Dataset in "source" module can be imported into a "target" module
  - The imported dataset can then be referenced by searches executed in the context of the "target" module
- **Rules**
  - Rules group actions (or search time enrichments) that should be run together.
  - Every Rule has a match constraint on sourcetype
  - Rules (and their Actions) are in scope when reading from an index in the same module as the Rule
  - Rules from can be imported into a second module.
  - The imported rule is then in scope for searches run in the second module.



Import Related APIs

- Datasets
  - A dataset is imported by creating an **import dataset**
    - POST ➔ /<tenant>/catalog/v1/datasets
      - **Kind=import** and then set **sourceName** and **sourceModule**
  - Manipulate the import just like any other dataset
    - GET, PATCH, DELETE ➔ /<tenant>/catalog/v1/datasets/<resource-name>
  - You can find all places that import a dataset
    - GET /<tenant>/catalog/v1/datasets/<resource-name>/importedby
- Rules
  - POST /<tenant>/catalog/v1/rules/<resource-name>/importedby
  - GET, PATCH, DELETE /<tenant>/catalog/v1/rules/<import-resource-name>

Catalog: Importing a Dataset

Example: import main index in the shared module into mymodule as localmain

POST ~/<tenant>/catalog/v1/datasets

```
Content-Type: application/json
Accept: application/json
Authorization: <bearerTokenFor(ajames@splunk.com)>

{
    "name": "localmain",
    "module": "mymodule",
    "kind": "import",
    "sourceName": "main",
    "sourceModule": "shared"
}
```

```
Status: 201 Created
Content-Type: application/json
ContentLength: XXX
Location: ../mymodule.localmain

{
    "name": "localmain",
    "module": "mymodule",
    "kind": "import",
    "sourceName": "main",
    "sourceModule": "shared",
    "id": ”0001d9740db35a77d54bf32e",
    "owner": "ajames@splunk.com",
    "created": "2018-07-19 06:33:24.000824",
    "modified": "2018-07-19 06:33:24.000824",
    "version": 1,
    "createdby": "ajames@splunk.com",
    "modifiedby": "ajames@splunk.com",
    "resourcename": "mymodule.localmain",
    "internalname": null,
     "version": 1
}
```

GET ~/<tenant>/catalog/v1/datasets/mymodule.localmain

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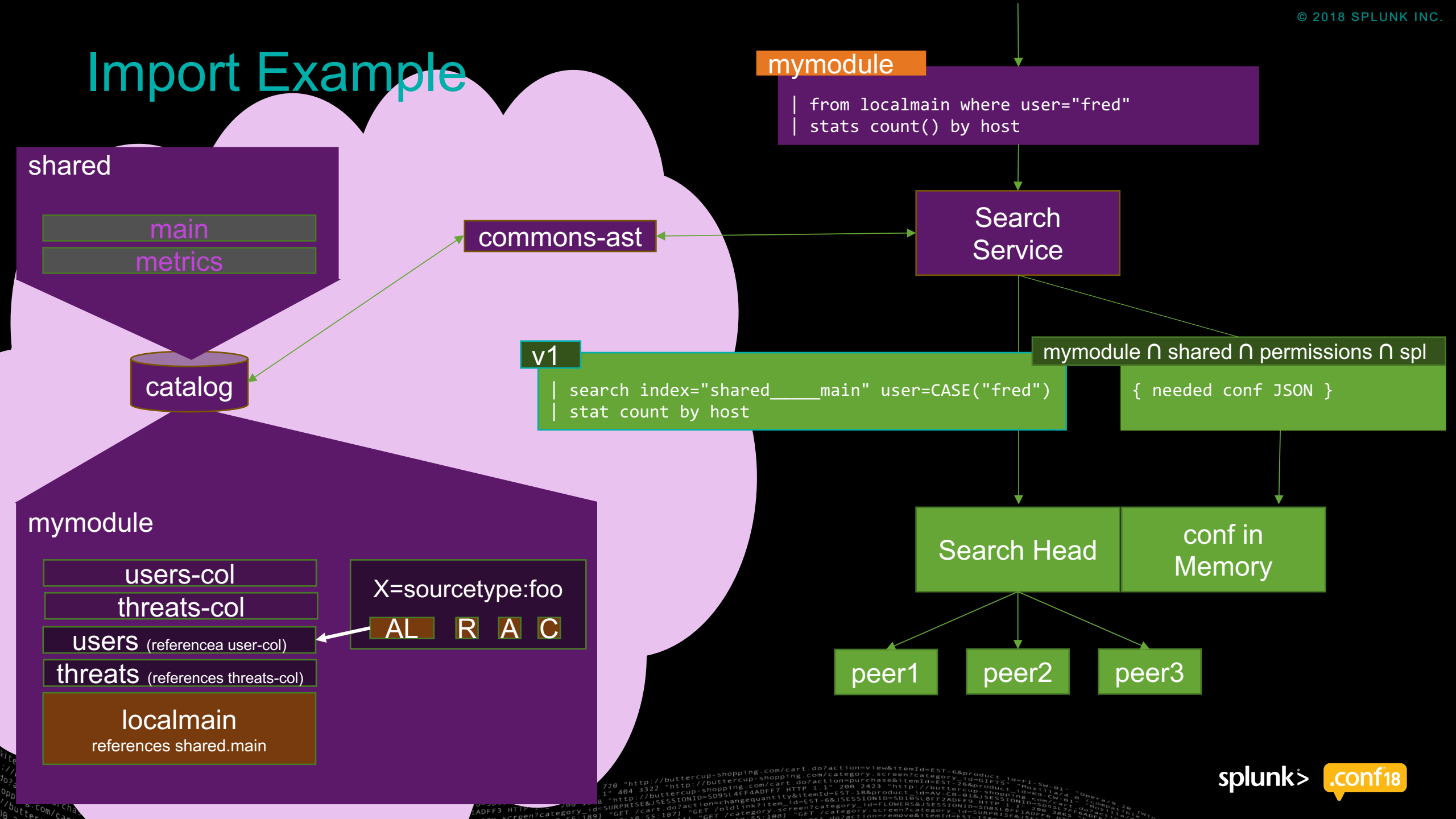
Import Example



SPL v2

Simplified and Consistent SPL

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Spl v2

Why? And what is it?

- Goals
  - Taking the best of Traditional Spl & applying lessons learned.
  - Syntax Consistency & Formal Grammar
  - Less commands to learn
- Key commands (so far)
  - **from**, **into**
  - **search**, **where**
  - **eval**, **rex**, **mvexpand**, **rename**
  - **bin, stats**, **chart**, **timechart**
  - **union**, **join**, **lookup**
  - **head**, **sort**, **dedup**

Spl v2: From

The most important command in SPL v2, for reading data 'from' a dataset

- SSC supports more clauses:
  - `| from <dataset> where <filter> groupby <field-list> select <projection-list> orderby <field-list>`
- SSC supports more types of datasets:
  - `| from index:main` ➔ `search index=main`
  - `| from job:<sid>` ➔ `| loadjob <sid>`
  - `| from lookup:users` ➔ `| inputlookup users`
  - `| from metric:metrics where groupby host select host, avg(cpu.percentage)` ➔ `| mstats avg(cpu.percentage) by host where metric_name="cpu.percentage"`
  - `| from view:mysearch` ➔ `<spl-defined-in-mysearch>`
  - `| from [<spl>]` ➔ `<spl>`
- No need to specify type:
  - i.e. `| from ~~type:~~name` works
  - Dataset names are unique (within a module), enforced by the catalog.
  - Specifying type is now essentially an assertion.
  - Best to avoid specifying type.

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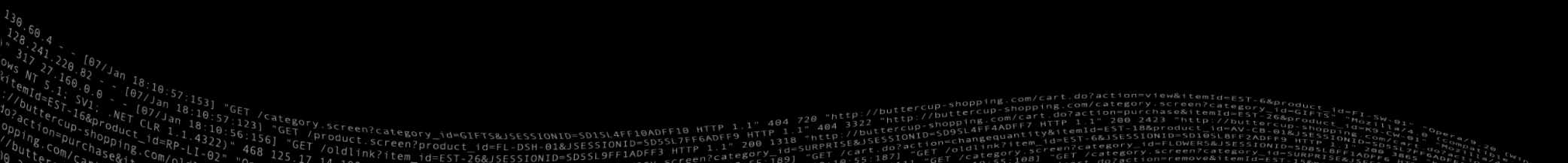
Spl v2

Other commands

- Syntax changes only:
  - **apply**, **bin**, **chart**, **eval**, **fields**, **fit**, **head**, **join**, **lookup**, **mvexpand**, **rename**, **rex**, **sort**, **search**, **timechart**, **union**, **where**
- Syntax & Semantics changes:
  - **dedup**: no sorting option, use **sort** instead
  - **stats**: now supports binning on time, i.e. | stats count by host, _time span=1m
- Alternatives to existing commands:
  - `mstats` ➔ `| from metric-index`
  - `mcatalog` ➔ `| from catalog.metrics …`
  - `inputlookup` ➔ `| from lookup`
  - `outputlookup` ➔ `| into mode=replace lookup`
  - `sendalert` ➔ `| into alerts`
- Coming Soon:
  - **fieldsummary**, **tstats** (or equivalent), **transaction (**simplified)
  - Let us know what commands you really really need…



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Search Service: Dispatching a Search

```
POST ~/<tenant>/search/v1/jobs
Content-Type: application/json
Accept: application/json
Authorization: <bearerTokenFor(ajames@splunk.com)>

{
    "module": "mymodule",
    "query":"| from index:metrics select avg(CPU)"
    "extractAllFields": false,    // default
    "maxTime": 3600,              // 1hr default
    "timeOfSearch": now(),        // default is now
    "timeFormat": "%FT%T.%Q%:z", // default
    "ttl":86400                   // i.e. 24hrs default
    "parameters": {
        "earliest": "-24h@h",
        "latest": "now()",
    }
}
```

```
Status: 201 Created
Content-Type: application/json
ContentLength: XXX

{
    "module": "mymodule",
    "query":"| from index:metrics select avg(CPU)"
    "sid": "1132142.2”,
    "status": "running",
    "extractAllFields": false,
    "maxTime": 3600,
    "timeOfSearch": "2018-07-27 09:14:20.000841",
    "resultsAvailable": 0,
    "timeFormat": "%FT%T.%Q%:z",
    "ttl":86400 ,
    "percentComplete": 0,
    "messages":[],
    "parameters": {
        "earliest": "-24h@h",
        "latest": "now()",
    }
}
```

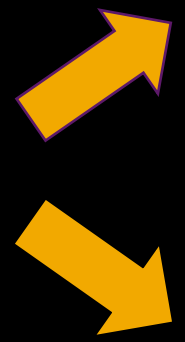
Search Service: Canceling a search

```
PATCH ~/<tenant>/search/v1/jobs/1132142.2
Content-Type: application/json
Accept: application/json
Authorization: <bearerTokenFor(ajames@splunk.com)>
X-Request-ID: <assignedByGatewayService>

{
    "status" : "cancelled"
}
```

```
Status: 200 OK
Content-Type: application/json
ContentLength: XXX

{
    "module": "mymodule",
    "query":"| from index:metrics select avg(CPU)",
    "sid": "1132142.2",
    "status": "cancelled",
    "extractAllFields": false,
    "maxTime": 3600,
    "timeOfSearch": "2018-07-27 09:14:20.000841",
    "resultsAvailable": 0,
    "timeFormat": "%FT%T.%Q%:z",
    "ttl":86400 ,
    "percentComplete": 100,
    "messages":[],
    "parameters": {
        "earliest": "-24h@h",
        "latest": "now()",
    }
}
```

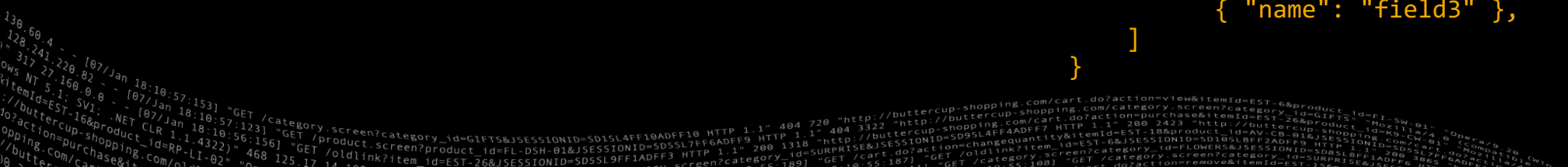
Search Service: Download Results

```
GET ~/<tenant>/search/v1/jobs/1132142.2/results
Accept: application/json
Authorization: <bearerTokenFor(ajames@splunk.com)>
X-Request-ID: <assignedByGatewayService>
```



```
Status: 200 OK
Content-Type: application/json
ContentLength: XXX

{
    "nextLink": "/results",
    "wait": "2000"
}
```

```
Status: 200 OK
Content-Type: application/json
ContentLength: XXX

{
    "messages": [ <array of messages>],
    "results": [{
            "field1": "value1",
            "field2": "value2",
            "field3": "value3"
    }],
    "fields": [
            { "name": "field1" },
            { "name": "field2" },
            { "name": "field3" },
    ]
}
```



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Search Service: Integration with the Catalog

- When a search is dispatched:
  - A **Job** dataset is created in the Catalog
  - **The Job** dataset is *not* updated until Job is **finished**
  - Latest state is accessible via Search Service
  - When Search finishes the **Job** Dataset is updated
    - Initially just changing state and duration etc.
    - Eventually this will include more statistics.
- **Job** Dataset can stay in Catalog forever if necessary
  - We will make **| from <sid>** will work beyond the ttl

```
{
"id": #id#
"name": "sid.123141424",
"status": "running“
"module": "mymodule",
"kind": "job",
"sid": "123141424",
"query": "| from indexname | stats count() by host",
"timeOfSearch": "2018-07-27 09:14:20.000841",
"resultsAvailable": 0,
"spl": "search index=mymodule_____indexname |
                stats count by host“
"timeFormat": "%FT%T.%Q%:z",
"deleteTime": "2018-07-28 09:14:20.000841“,
"parameters": {
     "earliest": "-24h@h",
     "latest": "now()",
 },
"owner": #jobexecutor#,
"created": #createdTime#,
"modified": "#modifiedTime#,
"version": 1,
"createdby": #jobexecutor#,
"modifiedby": #jobexecutor#
}
```

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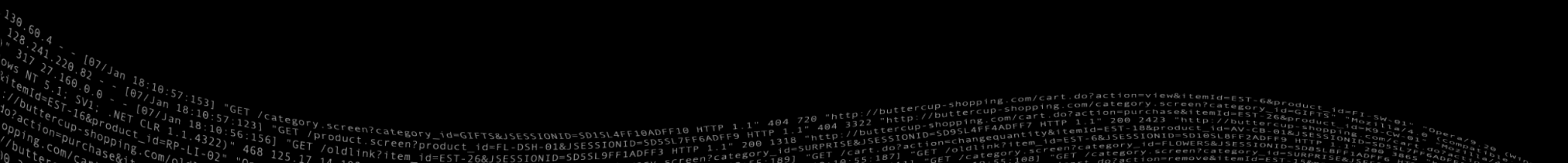

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Questions?