



Extending SPL with Custom Search Commands

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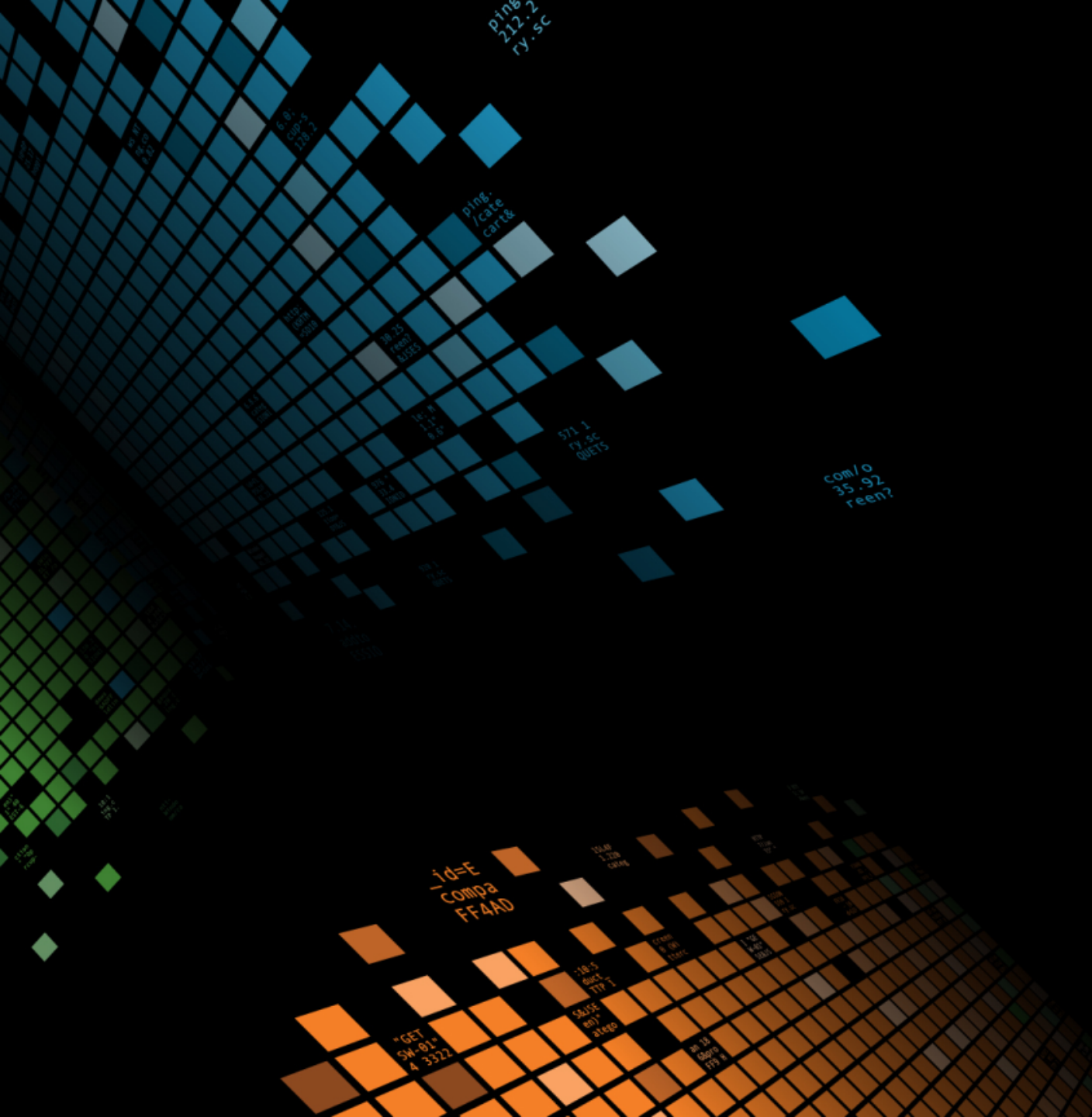
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Agenda

- Introduction to Custom Search Commands
- How do Custom Search Commands work?
 - High-level concepts
 - Low-level details
- Types of Search Commands
- How to create new Custom Search Commands
- Wrap-up

Introduction to Custom Search Commands



What is a Custom Search Command?

- A user-defined SPL command.



New Search

Save As Close

| search

```
index=_internal
| timechart span=1h sum(bytes) as bytes_per_hour
| eventstats avg(bytes_per_hour) as avg, stdev(bytes_per_hour) as sd
| where bytes_per_hour > avg+2*sd
```

All time

✓ 717,267 events (before 7/31/16 12:31:47.000 PM) No Event Sampling Job [] [] [] [] Smart Mode

Events Patterns Statistics (6) Visualization

20 Per Page Format Preview

_time	bytes_per_hour	avg	sd
2016-06-27 15:00	537341332	25656193.821656	130630657.753866
2016-07-07 10:00	561302261	25656193.821656	130630657.753866
2016-07-18 08:00	1119869427	25656193.821656	130630657.753866
2016-07-27 20:00	546033010	25656193.821656	130630657.753866
2016-07-31 11:00	541538796	25656193.821656	130630657.753866
2016-07-31 12:00	555149531	25656193.821656	130630657.753866

130.60.4 - - [07/Jun 18:10:57] "GET /category.screen?category_id=GIFTS&SESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 404 720 "http://buttercup-shopping.com/category.purchase?item_id=EST-16&product_id=RP-LI-02" "Mozilla/5.0 (Windows NT 5.1; SV1; .NET CLR 1.1.4322) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/46.0.2486.0 Safari/537.36



Search | Splunk 6.4.1 Login | Splunk Jacob

127.0.0.1:8004/en-US/app/search/search?q=search%20index%3D_internal%20%7C%20GOCRA...

splunk> App: Search & R... Administrator Messages Settings Activity Help Find

Search Pivot Reports Alerts Dashboards Search & Reporting

New Search

index=_internal | GOCRAZY All time [Search Icon]

487 of 489 events matched No Event Sampling Job [Pause] [Stop] [Refresh] [Export] [Download] Smart Mode

Events (487) Patterns Statistics Visualization

Format Timeline - Zoom Out + Zoom to Selection x Deselect 1 second per column

List Format 20 Per Page < Prev 1 2 3 4 5 6 7 8 9 ... Next >

< Hide Fields All Fields		i	Time	Event
Interesting Fields a cieipntl 1 a copnmtneo 1 # d_eatryea 1 # d_eatymda 1 a d_eatywda 1 a d_entezoa 1 # d_eutrhoa 1 a dc_ 100+ # dis 4 a dmnerr_eirfoae 1 # dsd_nceteoa 60 a dteni 1 a eamn 32 a ec_rptuoays 3 # eilf 17		>	7/31/16 12:48:14.763 PM	m __Furd i_7x=ar_N1=prl00a,0i ncdhagaagxedros - o0e=7oc.iwsre l_ gei,06pein: _ cwig4,oxlt_arm=e00neI0ede0iuta,d=,4n1m 0t0ua:iip3dshoe p3_oe8 =m-2lntpax,0,l1t cag m0 oxn6aa0g._mt7t_uktl,i,,girt0h=n1t1l=,a0=eawy0pw=mdlann,na0g= c0r= dg0-.xsr c= a0=ettm2t0usmd0,e,0-ro 0 sdm
		>	7/31/16 12:48:14.763 PM	=8 24mm1so=npti.s9-F1as=c 2a0u 311=,ma806700egr1-0 pg,_uI4-92u9 t47vdM0ds3se,_r 3, ic0siv9 6a :r4 0 =xex=eu v06ee3c61e,- 177 5oduo0p3r3r5=Na,04_y1:d2_atp17
		>	7/31/16 12:48:14.589 PM	ereltc18%=3/t".5.T 7eed0=acPd.rr-%a4vK58He 9." /.l1i3p10elsanrdce2qpich/3 SyWni6 e0me9mlntpme1xb.&i0gey & st&.04pfti-/0iSe &/:/ cs&.s1e24c]r0da36e6 rtc5cne2fas6C Or5s00)p1%pnw:1ad3:rr/12mU3in/ahsna"ne1/ntin0o_&3l9hs.ni8se4.o1as.i0Ua2S4=fdlast 4l=Mntf. ea0aKa9=u2e/o8e6okmrfh9l)asdae-o 0e%07ga a8otevp0a 0G.l_30z8t1.u.1g 0eb 2a(1dp9b00pbe3to3eyeie;7.ca4y==J8Ta4adp7:6"t=e0t1.r/yHsci 47035"".6&41re, i5s a 66 ?T..cse011nra./Mt11/1pehcoo9ts0e =eercm7s1ih40I7ve/c.sbp1lspe4(1v190i7l.sien5 6cidsp_6-d/9.e s1 d/rr0syv80i =.19yfb&ty3/j?mDetk102s3h4:hakeslfp.fg90opc&zsaL sbh 5sln5=t.e%/tat63631sat_lteMaesl/_X7/1fla 0u&p=&f0ni4ai[cf=eg2MpA -htr_1..
		>	7/31/16 12:48:14.588 PM	svi.0sHq-?ectt32a&l25smeK2dsedume6Ta0010n.Sccpb.oClef mv18r3 leHm/8e 0l .cenp1ge tct1co7EaM th0n7h_m5i80cpS:1p&respa&i1v7sK%1e;ias e_fc1So/p lt/r/rr/yc4e&mf4/0../.Ne/e1sJc0d.s050"ng0eeof1h_0=cep.=9=aS.1s]=ea3rb 2k)0C1=1&ta9:pp4_a od..4ib(?GU83e82eTh608ee6n0.sh1_k=vj-/a2=W96v97p.1lyr8.fot4 l p.i0aef7ad/s"fmT.yM s%a0.s0ets4sD/5nene="8 t.re.le0 :t" rMlp4/_2azf=/3s"/ap ./r8s4iu99Usad544/r1s06a53pu04&si=7er.lt/1a/&o:ihraimr.t36ba6rr/nAeqs.cyo31&031

What is a Custom Search Command?

- A user-defined SPL command.
- Can be used to extend the SPL language!

130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=F1-5W-03"
128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&JSESSIONID=SD5L7FF6ADFF0 HTTP 1.1" 404 3322 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-268product_id=KQ-CW-01"
137.27.160.0 - - [07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-348"
130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=F1-5W-03"
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137.27.160.0 - - [07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-348"
130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=F1-5W-03"
128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&JSESSIONID=SD5L7FF6ADFF0 HTTP 1.1" 404 3322 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-268product_id=KQ-CW-01"
137.27.160.0 - - [07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-348"

Who uses Custom Search Commands?

- Partners
 - Concanon, etc.
- Customers
 - Use-case specific analytics
- Splunk!
 - **predict** command
 - IT Service Intelligence
 - Enterprise Security
 - DB Connect
 - Machine Learning Toolkit
- Anyone who wants to extend the Splunk platform
 - Integration with 3rd party services
 - Implementation of custom logic

How do Custom Search Commands work?

How do Custom Search Commands work?

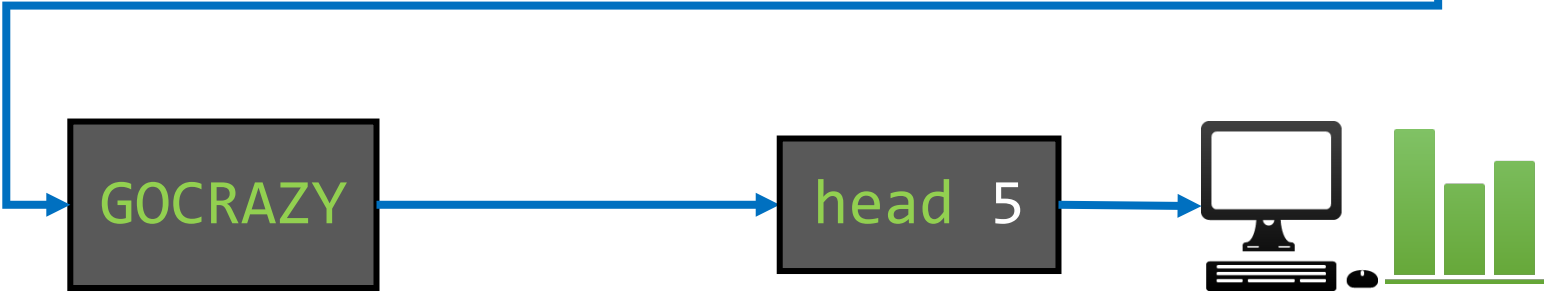
1. When parsing SPL, splunkd interrogates each command.
“Are you a Custom Search Command?”
2. If so, spawn external process and allow it to parse arguments.
3. During search, pipe search results through external process.

Parsing #1: Split search into commands

| inputlookup geo_attr_us_states.csv | GOCRAZY | head 5



inputlookup geo_attr_us_states.csv



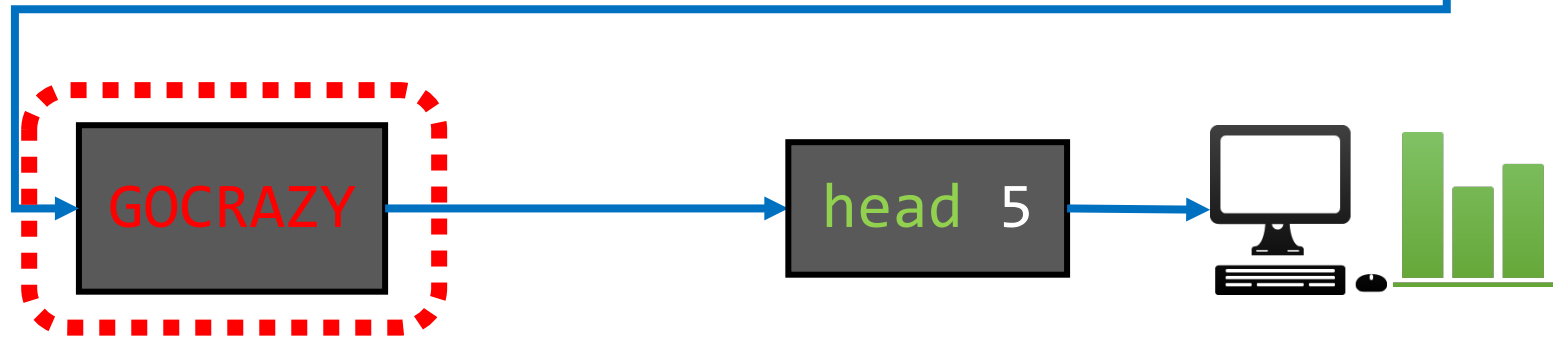
130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=5D15LAF10ADFF10 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=F1-5W-03" "Mozilla/5.0 (Windows NT 5.1; SV1; .NET CLR 1.1.4322)" 468 125.17 14.10.10.10
128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&JSESSIONID=5D35L7FF6ADFF0 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=5D15LAF10ADFF10 HTTP 1.1" 200 585 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-14" "Mozilla/5.0 (Windows NT 5.1; SV1; .NET CLR 1.1.4322)" 468 125.17 14.10.10.10
130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=5D15LAF10ADFF10 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=F1-5W-03" "Mozilla/5.0 (Windows NT 5.1; SV1; .NET CLR 1.1.4322)" 468 125.17 14.10.10.10
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130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=5D15LAF10ADFF10 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=F1-5W-03" "Mozilla/5.0 (Windows NT 5.1; SV1; .NET CLR 1.1.4322)" 468 125.17 14.10.10.10
128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&JSESSIONID=5D35L7FF6ADFF0 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=5D15LAF10ADFF10 HTTP 1.1" 200 585 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-14" "Mozilla/5.0 (Windows NT 5.1; SV1; .NET CLR 1.1.4322)" 468 125.17 14.10.10.10

Parsing #2: Look for custom search commands

| `inputlookup geo_attr_us_states.csv` | `GOCRAZY` | `head 5`



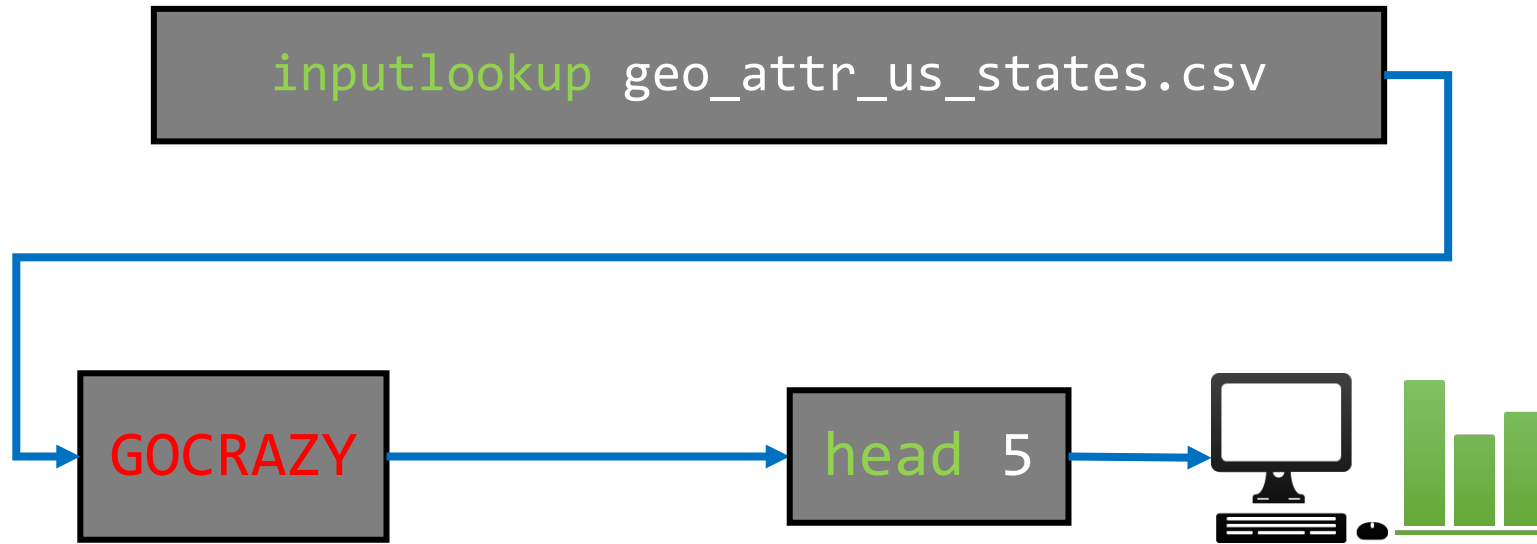
`inputlookup geo_attr_us_states.csv`



130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=5D15LAF10ADFF10 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=FI-5W-03" "Mozilla/5.0 (Macintosh; Intel Mac OS X 11_0_0; rv:53.0) Gecko/20100801 Firefox/53.0" 128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&JSESSIONID=5D35L7FF6ADFF0 HTTP 1.1" 404 3322 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CW-01" "Mozilla/5.0 (Macintosh; Intel Mac OS X 11_0_0; rv:53.0) Gecko/20100801 Firefox/53.0" 317.27.160.0 - - [07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=5D15L8FF2ADFF9 HTTP 1.1" 200 2423 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CW-01" "Mozilla/5.0 (Macintosh; Intel Mac OS X 11_0_0; rv:53.0) Gecko/20100801 Firefox/53.0" 10.0.0.1 - - [07/Jan 18:10:55:187] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CW-01" "Mozilla/5.0 (Macintosh; Intel Mac OS X 11_0_0; rv:53.0) Gecko/20100801 Firefox/53.0" 10.0.0.1 - - [07/Jan 18:10:55:189] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CW-01" "Mozilla/5.0 (Macintosh; Intel Mac OS X 11_0_0; rv:53.0) Gecko/20100801 Firefox/53.0" 10.0.0.1 - - [07/Jan 18:10:55:188] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CW-01" "Mozilla/5.0 (Macintosh; Intel Mac OS X 11_0_0; rv:53.0) Gecko/20100801 Firefox/53.0"

Parsing #3: Spawn external process

| `inputlookup geo_attr_us_states.csv` | `GOCRAZY` | `head 5`

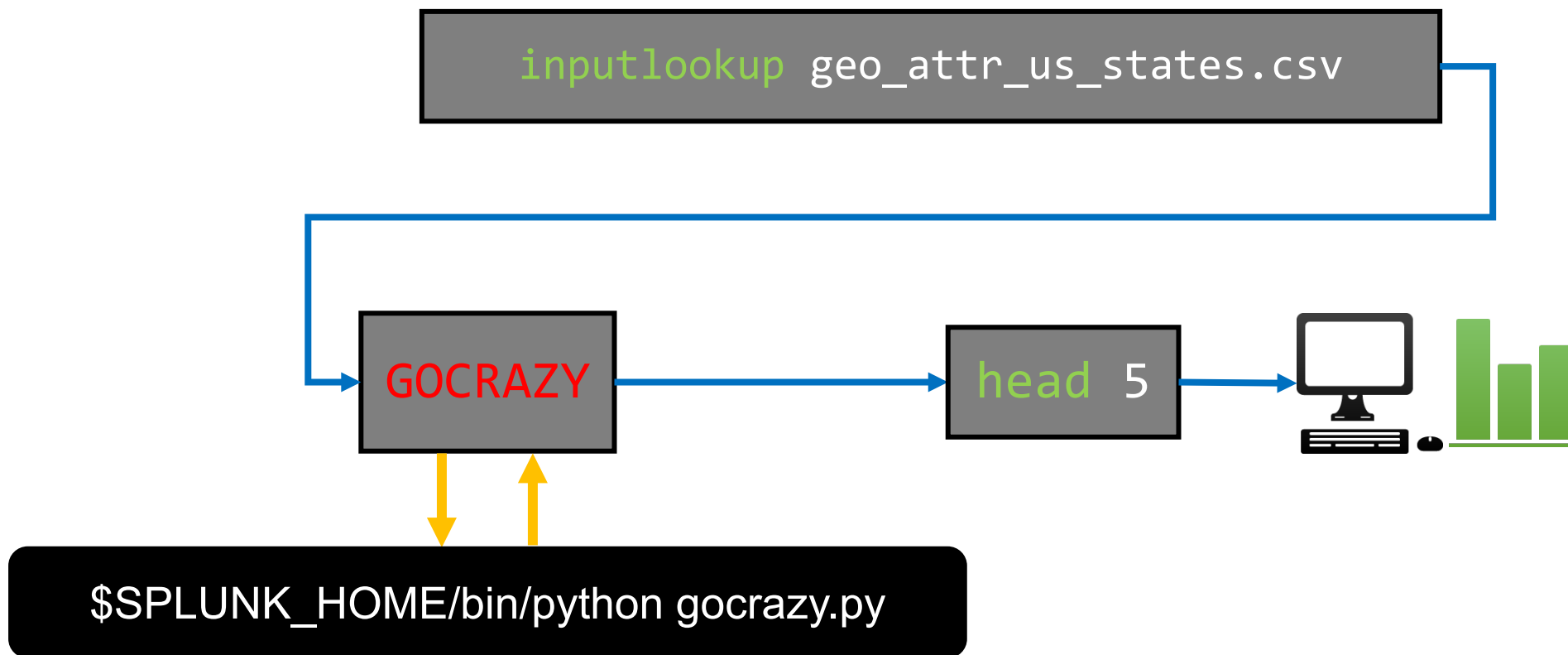


```
$SPLUNK_HOME/bin/python gocrazy.py
```

130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=5D15LAF10ADFF10 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=FI-5W-03" "Mozilla/5.0 (Windows NT 5.1; SV1; .NET CLR 1.1.4322)" 468 125.17 14.10.10.108

Parsing #4: Let external process parse arguments

| `inputlookup geo_attr_us_states.csv` | `GOCRAZY` | `head 5`



Recap: high-level concepts

- Enable you to register new SPL commands, extend the language.
- Allow you to intercept and modify search results during a search.
 - CSV in → CSV out
- Implemented as an external process (i.e. a program you write).
 - Typically written in Python.

splunkd ↔ custom command

- There are two “protocols” for custom commands:
 - Version 1, legacy protocol used by Intersplunk.py (available since Splunk 3.0)
 - Version 2, new protocol used by Python SDK (available since 6.3)
 - In both protocols, all communication over stdin/stdout
- Version 2 protocol
 - Spawns external process once, streams results through chunk by chunk
 - Simple commands.conf configuration
 - “chunked=true”
 - Support for platform-specific programs
- Version 1 protocol
 - Spawns external process for each chunk of search results (!)
 - “Transforming” commands limited to 50,000 events

Search Command protocol comparison

Protocol	APIs	Performance	Scalability	Simple configuration	Platform-specific programs	Programming languages
Version 1 (legacy)	Intersplunk.py, Python SDK	✗	✗	✗	✗	Python
Version 2	Python SDK	✓	✓	✓	✓	Python, arbitrary binaries

Search Command Protocol Version 2

- Transaction-oriented
 - splunkd sends a command, external process responds with reply
- Simple bi-directional transport protocol:
 - ASCII transport header
 - JSON metadata payload
 - CSV search results payload
- Every search starts with a “getinfo” command (capability exchange)
- Subsequently, issues “execute” commands with search results

Example: GOCRAZY

| inputlookup geo_attr_us_states.csv | head 5 | GOCRAZY

```

chunked 1.0,22,106
{"action": "execute"}
state_code,state_fips,state_name
AL,01,Alabama
AK,02,Alaska
AZ,04,Arizona
AR,05,Arkansas
CA,06,California

```

`$(SPLUNK_HOME)/bin/python
gocrazy.py`

```

chunked 1.0,18,106
{"finished": true}
dste_aecot,pste_asfit,mste_aenat
LA,10,aaalbmA
KA,20,laaska
ZA,40,iaorzna
RA,50,Akaasnsr
AC,60,iCifolarna

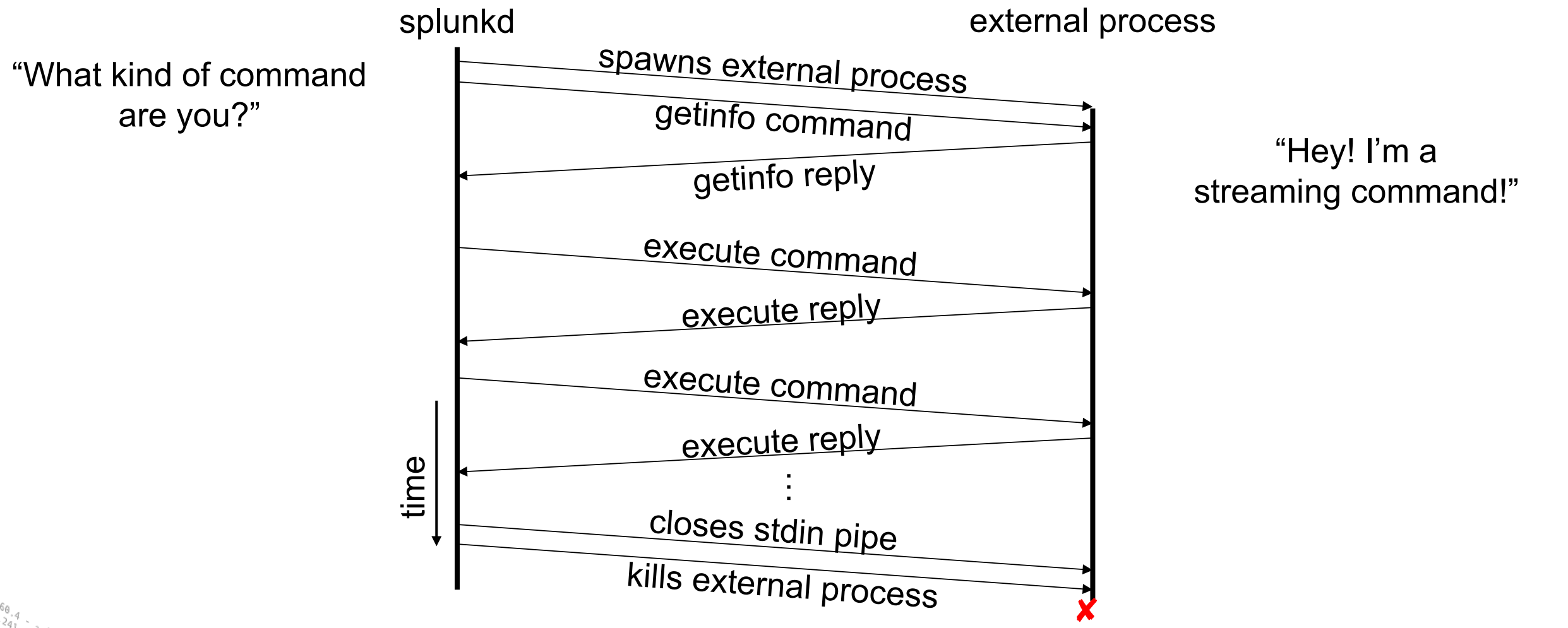
```

```

130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&SESSIONID=5D5L9FF1ADFF3 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=FI-5W-03"
128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&SESSIONID=5D5L9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=FI-5W-03"
317.27.160.0.0 - - [07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&SESSIONID=5D5L9FF1ADFF3 HTTP 1.1" 200 385 "http://buttercup-shopping.com/oldlink?item_id=EST-26&SESSIONID=5D5L9FF1ADFF3"
10.0.0.1 - - [07/Jan 18:10:56:189] "GET /category.screen?category_id=FLOWERS&SESSIONID=5D5L9FF1ADFF3 HTTP 1.1" 200 385 "http://buttercup-shopping.com/oldlink?item_id=EST-26&SESSIONID=5D5L9FF1ADFF3"

```


Protocol Version 2: Transaction timeline



“What kind of command are you?”

“Hey! I’m a streaming command!”

```

130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&SESSIONID=SD5L7FF6ADFF9 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=FI-SW-03"
128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&SESSIONID=SD5L7FF6ADFF9 HTTP 1.1" 404 3322 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CU-01"
317.27.160.0 - - [07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&SESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&SESSIONID=SD5L7FF6ADFF9"
[07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&SESSIONID=SD5L9FF1ADFF3 HTTP 1.1" 200 3885 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&SESSIONID=SD5L7FF6ADFF9"
468 125.17.14.189 - - [07/Jan 18:10:56:187] "GET /cart.do?action=remove&itemId=EST-18"
468 125.17.14.189 - - [07/Jan 18:10:56:187] "GET /category.screen?category_id=FLOWERS&SESSIONID=SD5L7FF6ADFF9 HTTP 1.1" 200 3885 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-18"

```

“getinfo” command

- Metadata in the getinfo command sent by splunkd:
 - Command arguments
 - Full SPL query string
 - Execution context (app, user)
 - Search sid
 - splunkd URI and auth token (for making REST requests)
- Metadata in the custom command’s reply:
 - Type of search command (streaming/stateful/reporting/etc.)
 - Which fields splunkd should extract (required fields)
 - Whether or not it generates results (e.g. must be first search command)

Sample “getinfo” metadata

```
{
  "action": "getinfo",
  "streaming_command_will_restart": false,
  "searchinfo": {
    "earliest_time": "0",
    "raw_args": [
      "LinearRegression", "petal_length", "from", "petal_width"
    ],
    "session_key": "...",
    "maxresultrows": 50000,
    "args": [
      "LinearRegression", "petal_length", "from", "petal_width"
    ],
    "dispatch_dir": "/Users/jleverich/builds/conf_mlapp_demo/var/run/splunk/dispatch/1475007525.265",
    "command": "fit",
    "latest_time": "0",
    "sid": "1475007525.265",
    "splunk_version": "6.5.0",
    "username": "admin",
    "search": "%7C%20inputlookup%20iris.csv%20%7C%20fit%20LinearRegression%20petal_length%20from%20petal_width",
    "splunkd_uri": "https://127.0.0.1:8090",
    "owner": "admin",
    "app": "Splunk_ML_Toolkit"
  },
  "preview": false
}
```

“execute” command

- Metadata in execute command sent by splunkd
 - Whether or not preceding commands are “finished”
- Metadata in the custom command’s reply:
 - Whether or not this command is “finished”
- splunkd and search commands negotiate completion of search
 - Both must indicate “finished” = True

Types of Search Commands

Types of Search Commands

- “Streaming” commands
- “Stateful Streaming” commands
- “Transforming” commands
 - “Events” commands
 - “Reporting” commands

130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&SESSIONID=SD1SLAFF10ADFF10 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=F1-SW-03" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_12_0; rv:52.0) Gecko/20100801 Firefox/52.0" [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&SESSIONID=SD35L7FF6ADFF0 HTTP 1.1" 404 3322 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CB-01" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_12_0; rv:52.0) Gecko/20100801 Firefox/52.0" [07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&SESSIONID=SD5SL9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&SESSIONID=SD1B5L8FF2ADFF9 HTTP 1.1" 200 2423 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-18&product_id=AV-CB-01&SESSIONID=SD1B5L8FF2ADFF9" [07/Jan 18:10:55:187] "GET /category.screen?category_id=FLOWERS&SESSIONID=SD35L7FF6ADFF0 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-18&product_id=KQ-CB-01" [07/Jan 18:10:55:189] "GET /category.screen?category_id=SURPRISE&SESSIONID=SD35L7FF6ADFF0 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-18&product_id=KQ-CB-01" [07/Jan 18:10:55:187] "GET /category.screen?category_id=SURPRISE&SESSIONID=SD35L7FF6ADFF0 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-18&product_id=KQ-CB-01" [07/Jan 18:10:55:189] "GET /category.screen?category_id=SURPRISE&SESSIONID=SD35L7FF6ADFF0 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-18&product_id=KQ-CB-01"

“Streaming” commands

- Process search results one-by-one
 - Can't maintain global state
 - Must not re-order search results
- Eligible to run at Indexers
 - Can run in parallel on Indexers
- Examples:
 - eval
 - where
 - rex

“Streaming” command example

... | eval foo="bar" | ...

Remote results

field_A	field_B	field_C
the	jumps	dog

field_A	field_B	field_C
quick	over	oops

field_A	field_B	field_C
brown	the	too

field_A	field_B	field_C
fox	lazy	many



Indexers



Search head

Final search results

field_A	field_B	field_C	foo
the	jumps	dog	bar
quick	over	oops	bar
brown	the	too	bar
fox	lazy	many	bar

“Stateful Streaming” commands

- Process search results one-by-one
 - **Can** maintain global state
 - Must not re-order search results
- Only run at Search Head
- Examples:
 - accum
 - streamstats
 - dedup

```

130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=5D15LAF10ADFF10 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=F1-5W-01"
128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&JSESSIONID=5D35L7FF6ADFF0 HTTP 1.1" 404 3322 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=K0-CW-01"
ows NT 5.1; SV1; .NET CLR 1.1.4322) 468 125.17 14.189 "GET /oldlink?item_id=EST-26&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=5D55L9FF1ADFF3"
:/buttercup-shopping_id=RP-LI-02" 404 125.17 14.189 "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-14&product_id=K0-CW-01"
:/buttercup-shopping.com/cart.do?action=remove&itemId=EST-14&product_id=K0-CW-01"

```

“Stateful Streaming” command example

... | accum foo | ...

field_A	field_B	field_C	foo
the	jumps	dog	1
quick	over	oops	1
brown	the	too	1
fox	lazy	many	1



field_A	field_B	field_C	foo
the	jumps	dog	1
quick	over	oops	2
brown	the	too	3
fox	lazy	many	4

“Events” commands

- Process search results as a whole
 - May re-order search results
 - Typically maintain all fields in each event, especially:
 - `_raw`, `_time`, `index`, `sourcetype`, `source`, `host`
- Only run at Search Head
- May run several times for “preview”
- Examples:
 - `sort`
 - `eventstats`

“Events” command example

... | sort field_A | ...

field_A	field_B	field_C	foo
the	jumps	dog	1
quick	over	oops	2
brown	the	too	3
fox	lazy	many	4



field_A	field_B	field_C	foo
brown	the	too	3
fox	lazy	many	4
quick	over	oops	2
the	jumps	dog	1

“Reporting” commands

- Process search results as a whole
 - Typically transform the results (e.g. aggregate, project, summarize, etc.)
- Only run at Search Head
- May run several times for “preview”
- Results show up in the “Statistics” tab
- Examples:
 - stats
 - timechart
 - transpose

“Reporting” command example

... | stats count | ...

field_A	field_B	field_C	foo
the	jumps	dog	1
quick	over	oops	2
brown	the	too	3
fox	lazy	many	4



count
4

Beware of large result sets!

- “Events” and “Reporting” commands process results as a whole.
 - May contain 1,000,000s of search results!
 - Write Streaming or Stateful commands instead when possible.
- Build-in capacity limits, or spill results to disk when necessary.

Streaming “pre-op”

- Commands may specify a “pre-op” to prepend in SPL

... | stats count | ... → ... | prestats count | stats count | ...

- Communicated to splunkd in getinfo metadata (streaming_preop)
- Useful to parallelize computation, reduce volume of data transfer
- Must be “Streaming” (i.e., may run at Indexers)

Implementing Custom Search Commands with the Splunk SDK for Python

Basic steps to create a search command

1. Create an “App”
2. Deploy the Python SDK for Splunk in the `bin` directory
3. Write a script for your Custom Search Command
4. Register your command in `commands.conf`
5. Restart Splunk Enterprise
6. (*optional*) Export the command to other apps

```

130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=5D15L9FF1ADFF3 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=FI-5W-01"
128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&JSESSIONID=5D35L7FF6ADFF0 HTTP 1.1" 404 3322 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CU-01"
ows NT 5.1; SV1; .NET CLR 1.1.4322" 468 125.17 14.1.189] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=5D15L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CU-01"
item_id=EST-16&product_id=RP-LI-02" 404 125.17 14.1.189] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CU-01"
action=purchase&itemId=EST-26&product_id=KQ-CU-01" 404 125.17 14.1.189] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CU-01"
http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CU-01" 404 125.17 14.1.189] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CU-01"

```

Create an "App"

The screenshot shows the Splunk Manager interface for managing search apps. The browser tabs include 'Settings | Splunk', 'Login | Splunk', and 'Search | Splunk 6.4.1'. The address bar shows the URL '127.0.0.1:8004/en-US/manager/search/apps/local'. The navigation bar includes 'splunk>', 'Apps', 'Administrator', 'Messages', 'Settings', 'Activity', 'Help', and a 'Find' search bar. The main heading is 'Apps'. Below the heading are three buttons: 'Browse more apps' (green), 'Install app from file', and 'Create app' (grey). A red arrow points to the 'Create app' button. Below the buttons, it says 'Showing 1-19 of 19 items' and 'Results per page 25'. A table lists installed apps with columns for Name, Folder name, Version, Update checking, Visible, Sharing, Status, and Actions.

Name	Folder name	Version	Update checking	Visible	Sharing	Status	Actions
SplunkForwarder	SplunkForwarder		Yes	No	App Permissions	Disabled Enable	
SplunkLightForwarder	SplunkLightForwarder		Yes	No	App Permissions	Disabled Enable	
ML Toolkit and Showcase	Splunk_ML_Toolkit	1.2	Yes	Yes	App Permissions	Enabled Disable	Launch app
Python for Scientific Computing	Splunk_SA_Scientific_Python_darwin_x86_64	1.2	Yes	No	App Permissions	Enabled Disable	Edit propert
Log Event Alert Action	alert_logevent	6.4.1	Yes	No	App Permissions	Enabled Disable	Edit propert
Webhook Alert Action	alert_webhook	6.4.1	Yes	No	App Permissions	Enabled Disable	Edit propert

Deploy the Python SDK in the bin directory

```
cd $SPLUNK_HOME/etc/apps/MyNewApp/bin
```

```
pip install -t . splunk-sdk
```

Write a script for your Custom Search Command

```
$SPLUNK_HOME/etc/apps/MyNewApp/bin/foobar.py
```

```
import sys
from splunklib.searchcommands import dispatch, StreamingCommand, Configuration

@Configuration()
class FoobarCommand(StreamingCommand):
    def stream(self, records):
        for record in records:
            record['foo'] = 'bar'
            yield record

if __name__ == "__main__":
    dispatch(FoobarCommand, sys.argv, sys.stdin, sys.stdout, __name__)
```

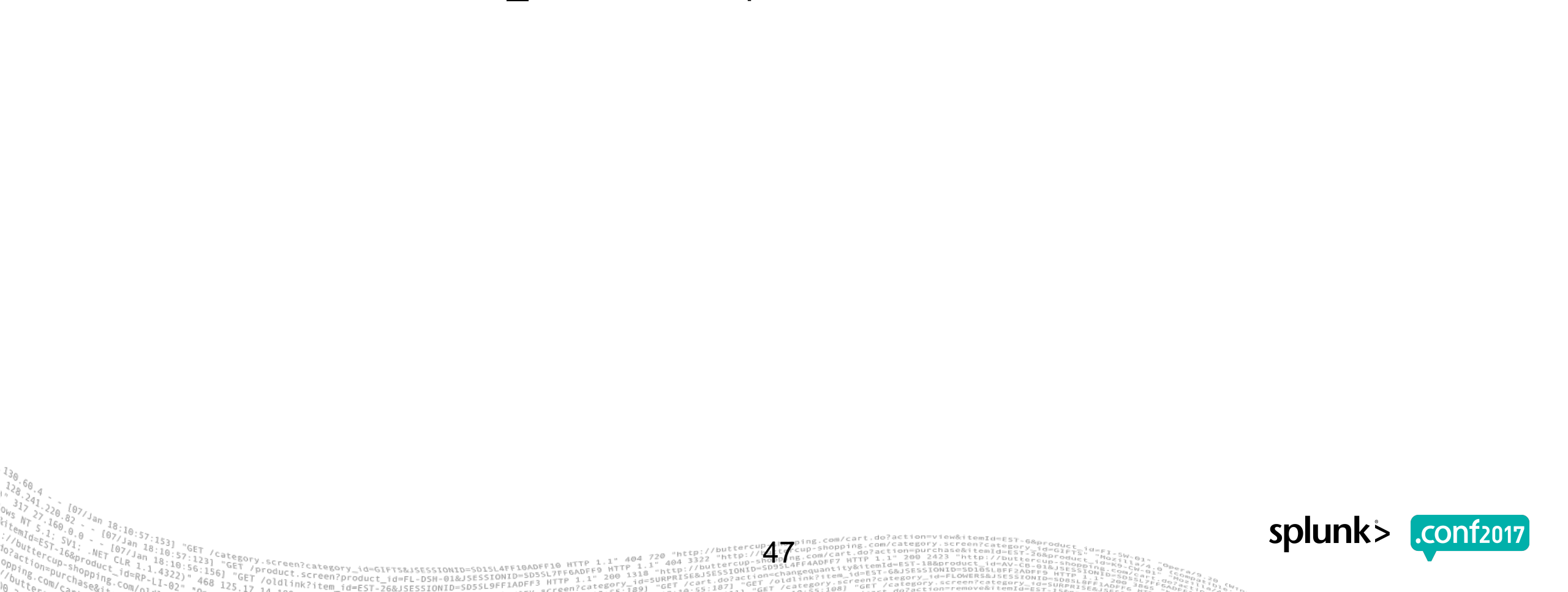
Register your command in commands.conf

```
$SPLUNK_HOME/etc/apps/MyNewApp/default/commands.conf
```

```
[foobar]  
chunked=true  
# filename=foobar.py    ## <--- optional
```

Restart Splunk Enterprise

```
$SPLUNK_HOME/bin/splunk restart
```



Export to other apps (optional)

The screenshot shows the Splunk Manager interface for managing search apps. The browser tabs include 'Settings | Splunk', 'Login | Splunk', and 'Search | Splunk 6.4.1'. The address bar shows '127.0.0.1:8004/en-US/manager/search/apps/local'. The page title is 'Apps'. Below the title are buttons for 'Browse more apps', 'Install app from file', and 'Create app'. A search bar is present. The main content area shows 'Showing 1-19 of 19 items' and 'Results per page 25'. A table lists the installed apps with columns for Name, Folder name, Version, Update checking, Visible, Sharing, Status, and Actions. A red arrow points to the 'View objects' link in the Actions column for the 'Apps Browser' app.

Name	Folder name	Version	Update checking	Visible	Sharing	Status	Actions
SplunkForwarder	SplunkForwarder		Yes	No	App Permissions	Disabled Enable	
SplunkLightForwarder	SplunkLightForwarder		Yes	No	App Permissions	Disabled Enable	
ML Toolkit and Showcase	Splunk_ML_Toolkit	1.2	Yes	Yes	App Permissions	Enabled Disable	Launch app Edit properties View objects
Python for Scientific Computing	Splunk_SA_Scientific_Python_darwin_x86_64	1.2	Yes	No	App Permissions	Enabled Disable	Edit properties View objects View objects
Log Event Alert Action	alert_logevent	6.4.1	Yes	No	App Permissions	Enabled Disable	Edit properties View objects
Webhook Alert Action	alert_webhook	6.4.1	Yes	No	App Permissions	Enabled Disable	Edit properties View objects
Apps Browser	appsbrowser	6.4.1	Yes	No	App Permissions	Enabled	Edit properties View objects
custom_search_example	custom_search_example		Yes	No	App Permissions	Enabled Disable	Edit properties View objects
framework	framework		Yes	No	App Permissions	Enabled Disable	Edit properties View objects
Getting started	gettingstarted	1.0	Yes	Yes	App Permissions	Disabled Enable	
introspection_generator_addon	introspection_generator_addon	6.4.1	Yes	No	App Permissions	Enabled Disable	Edit properties View objects

Export to other apps (optional)

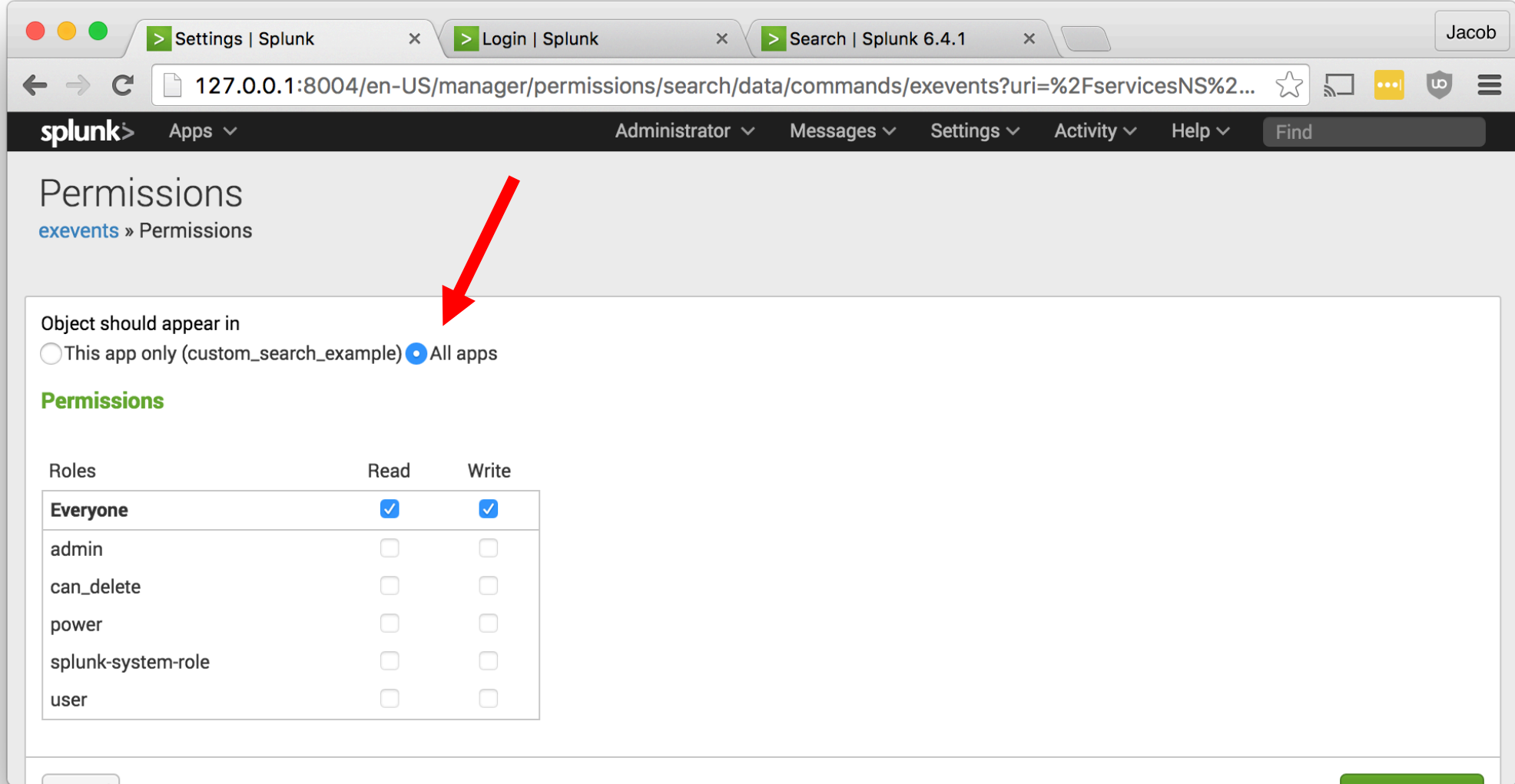
The screenshot shows the Splunk web interface for managing configurations. The browser tabs include 'Settings | Splunk', 'Login | Splunk', and 'Search | Splunk 6.4.1'. The address bar shows the URL: `127.0.0.1:8004/en-US/manager/search/admin/directory?ns=custom_search_example&app_only=1`. The page title is 'All configurations'.

Filters are set to 'App context: custom_search_example (custoi)' and 'Owner: Any'. A checkbox is checked for 'Show only objects created in this app context'. The results are displayed in a table with 6 items.

Showing 1-6 of 6 items Results per page 25

Name	Config type	Owner	App	Sharing	Status
exevents	commands	No owner	custom_search_example	Global Permissions	Enabled Disable
exreport	commands	No owner	custom_search_example	Global Permissions	Enabled Disable
exstateful	commands	No owner	custom_search_example	Global Permissions	Enabled Disable
exstream	commands	No owner	custom_search_example	Global Permissions	Enabled Disable
gocrazy	commands	No owner	custom_search_example	Global Permissions	Enabled Disable
levenshtein	commands	No owner	custom_search_example	Global Permissions	Enabled Disable

Export to other apps (optional)



Settings | Splunk Login | Splunk Search | Splunk 6.4.1 Jacob

127.0.0.1:8004/en-US/manager/permissions/search/data/commands/exeevents?uri=%2FservicesNS%2F...

splunk> Apps ▾ Administrator ▾ Messages ▾ Settings ▾ Activity ▾ Help ▾ Find

Permissions

exevents » Permissions

Object should appear in

This app only (custom_search_example) All apps

Permissions

Roles	Read	Write
Everyone	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
admin	<input type="checkbox"/>	<input type="checkbox"/>
can_delete	<input type="checkbox"/>	<input type="checkbox"/>
power	<input type="checkbox"/>	<input type="checkbox"/>
splunk-system-role	<input type="checkbox"/>	<input type="checkbox"/>
user	<input type="checkbox"/>	<input type="checkbox"/>

Example Streaming Command

```
$SPLUNK_HOME/etc/apps/MyNewApp/bin/exstream.py
```

```
import sys
from splunklib.searchcommands import dispatch, StreamingCommand, Configuration

@Configuration()
class ExStreamCommand(StreamingCommand):
    def stream(self, records):
        for record in records:
            record['foo'] = 'bar'
            yield record

if __name__ == "__main__":
    dispatch(ExStreamCommand, sys.argv, sys.stdin, sys.stdout, __name__)
```

Example Stateful Streaming Command

```
$SPLUNK_HOME/etc/apps/MyNewApp/bin/exstateful.py
```

```
import sys
from splunklib.searchcommands import dispatch, StreamingCommand, Configuration

@Configuration(local=True)
class ExStatefulCommand(StreamingCommand):
    def stream(self, records):
        for record in records:
            record['foo'] = 'bar'
            yield record

if __name__ == "__main__":
    dispatch(ExStatefulCommand, sys.argv, sys.stdin, sys.stdout, __name__)
```

Example Events Command

```
$SPLUNK_HOME/etc/apps/MyNewApp/bin/exevents.py
```

```
import sys
from splunklib.searchcommands import dispatch, EventingCommand, Configuration

@Configuration()
class ExEventsCommand(EventingCommand):
    def transform(self, records):
        l = list(records)
        l.sort(key=lambda r: r['_raw'])
        return l

if __name__ == "__main__":
    dispatch(ExEventsCommand, sys.argv, sys.stdin, sys.stdout, __name__)
```

Example Reporting Command

```
$SPLUNK_HOME/etc/apps/MyNewApp/bin/exreport.py
```

```
import sys
from splunklib.searchcommands import dispatch, ReportingCommand, Configuration

@Configuration()
class ExReportCommand(ReportingCommand):
    @Configuration()
    def map(self, records):
        return records

    def reduce(self, records):
        count = 0
        for r in records:
            count += 1
        return [{'count': count}]

if __name__ == "__main__":
    dispatch(ExReportCommand, sys.argv, sys.stdin, sys.stdout, __name__)
```

A little advice

- Custom commands are **programs** that run on Splunk instances

– **BEWARE UNVALIDATED INPUT!**

– Sanitize user arguments AND search results

- Use role-based access control to restrict access
- Be prepared to handle 1,000,000s of events
- **Be excellent to each other.**



made on imgur

What Now?

- <https://github.com/splunk/splunk-sdk-python>
 - https://github.com/splunk/splunk-sdk-python/tree/master/examples/searchcommands_app
- Dev Portal Documentation
 - <http://dev.splunk.com/view/python-sdk/SP-CAAUEU2>
- Contact: Developer Ecosystem Team <devinfo@splunk.com>

Thank You

Don't forget to **rate this session** in the
.conf2017 mobile app

splunk® **.conf2017**

Q&A

Backup Slides

Streaming Commands only serialize required fields

```
{“required_fields”: [“fieldX”], ...}
```

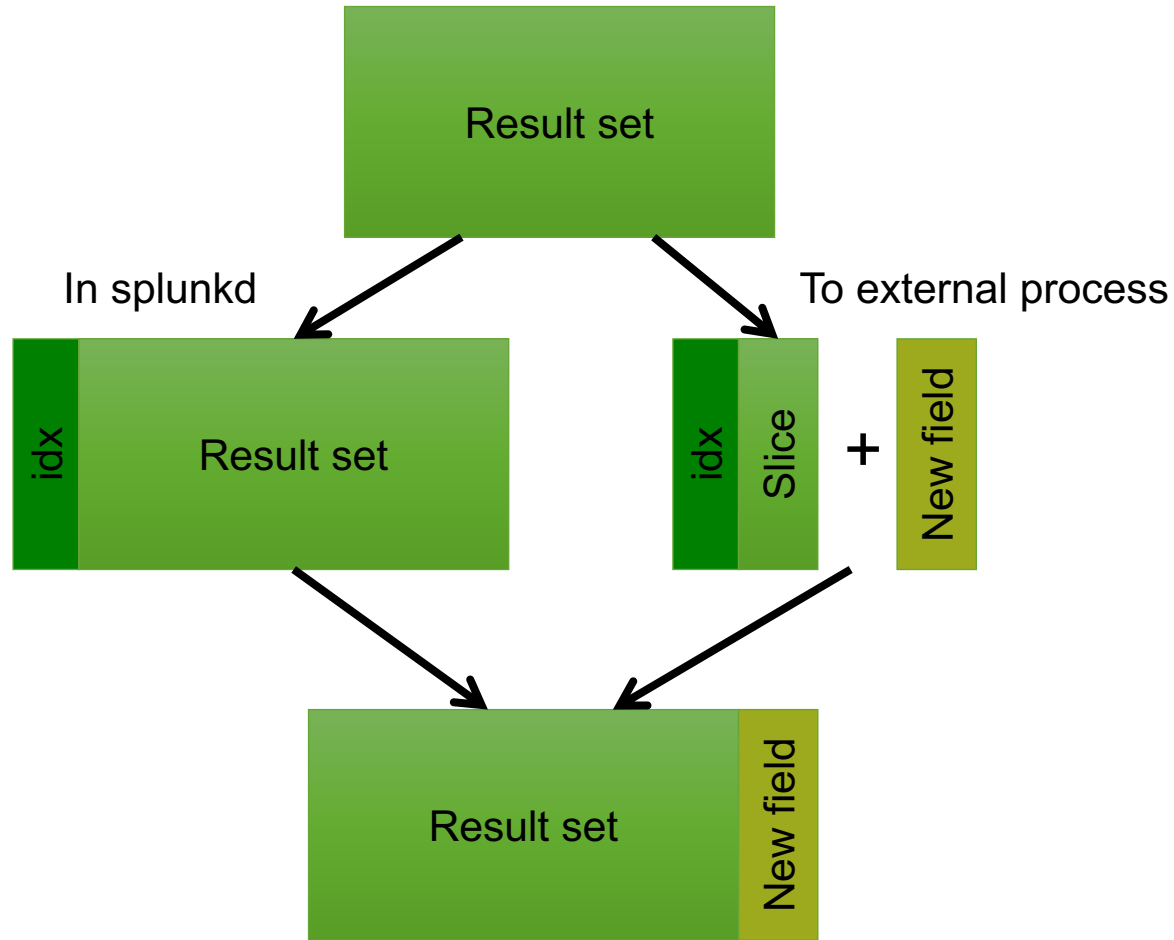
Internal result set

```
_raw,_time,_cd,_indextime,...,fieldX
a,1400000000,x:y,1400000010,...,BOB
a,1400000001,x:y,1400000011,...,JIM
a,1400000002,x:y,1400000012,...,BOB
a,1400000003,x:y,1400000013,...,JIM
a,1400000004,x:y,1400000014,...,JIM
a,1400000005,x:y,1400000015,...,BOB
a,1400000006,x:y,1400000016,...,JIM
a,1400000007,x:y,1400000017,...,BOB
a,1400000008,x:y,1400000018,...,BOB
a,1400000009,x:y,1400000019,...,JIM
```

External result set

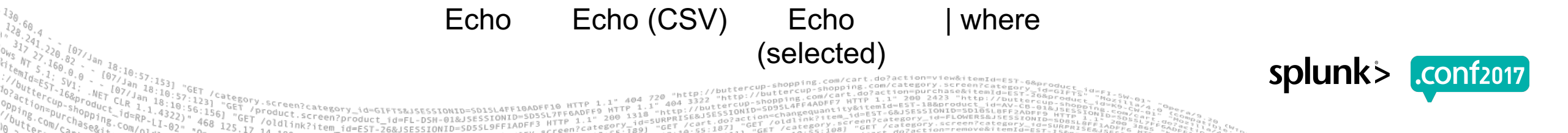
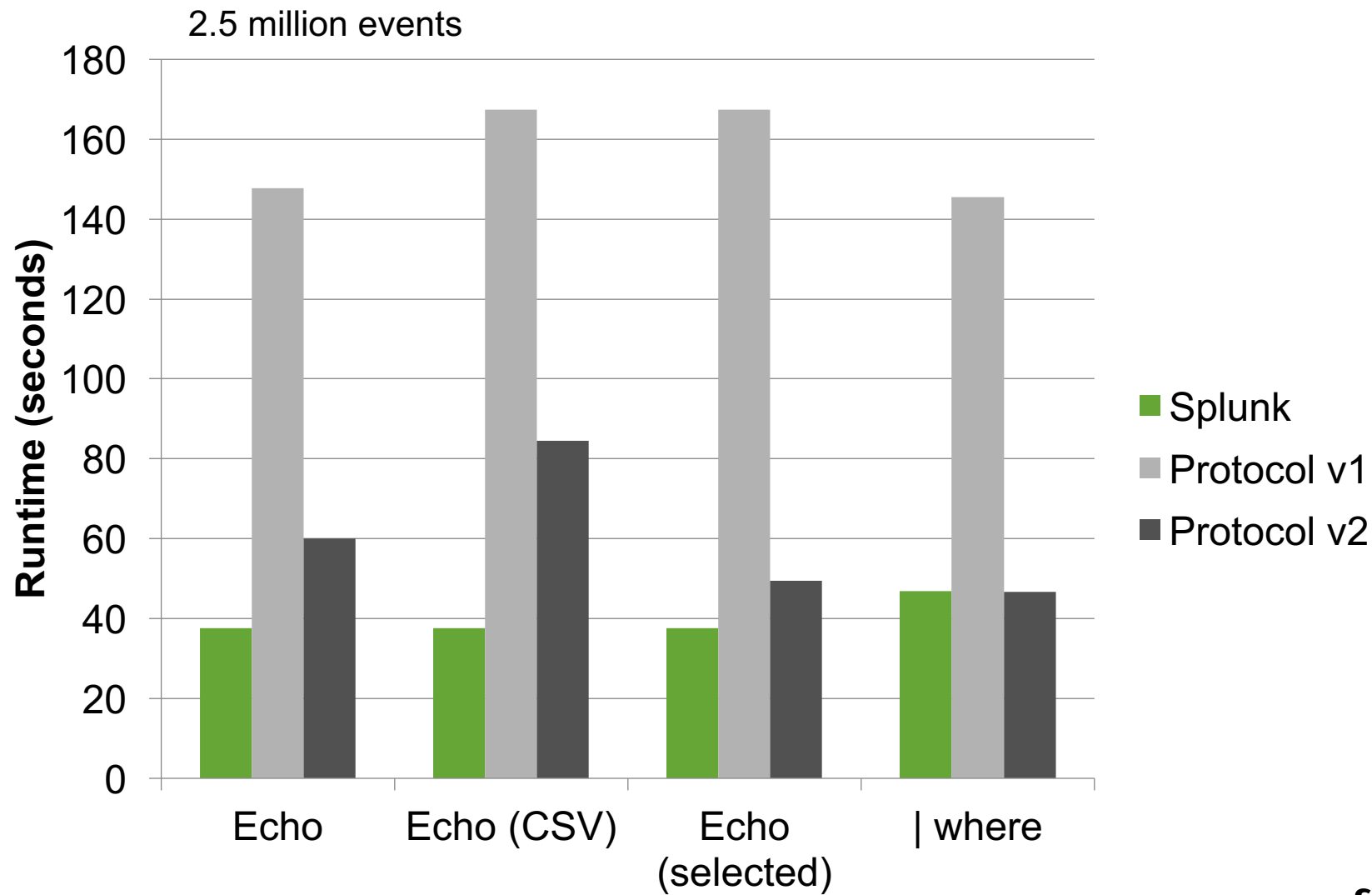
```
_chunked_idx,fieldX
0,BOB
1,JIM
2,BOB
3,JIM
4,JIM
5,BOB
6,JIM
7,BOB
8,BOB
9,JIM
```

“Right outer-join” on required fields



- Supports
 - Removing events
 - Adding events
 - Editing fields
 - Adding fields
- Can't re-order events

Performance comparison



“Streaming” command example

... | eval foo="bar" | ...

field_A	field_B	field_C
the	jumps	dog
quick	over	oops
brown	the	too
fox	lazy	many



field_A	field_B	field_C	foo
the	jumps	dog	bar
quick	over	oops	bar
brown	the	too	bar
fox	lazy	many	bar

130.60.4 - - [07/Jan 18:10:57:153] "GET /category.screen?category_id=GIFTS&JSESSIONID=5D15L9FF10ADFF10 HTTP 1.1" 404 720 "http://buttercup-shopping.com/cart.do?action=view&itemId=EST-6&product_id=FI-5W-03" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_2) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.150 Safari/537.36" 128.241.220.82 - - [07/Jan 18:10:57:123] "GET /product.screen?product_id=FL-DSH-01&JSESSIONID=5D55L7FF6ADFF0 HTTP 1.1" 404 3322 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CW-01" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_2) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.150 Safari/537.36" 317.27.160.0 - - [07/Jan 18:10:56:156] "GET /oldlink?item_id=EST-26&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 1318 "http://buttercup-shopping.com/cart.do?action=changequantity&itemId=EST-18&product_id=AV-CB-01&JSESSIONID=5D15L9FF1ADFF3 HTTP 1.1" 200 2423 "http://buttercup-shopping.com/cart.do?action=purchase&itemId=EST-26&product_id=KQ-CW-01" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_2) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.150 Safari/537.36" 10.0.0.0 - - [07/Jan 18:10:55:187] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-18" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_2) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.150 Safari/537.36" 10.0.0.0 - - [07/Jan 18:10:55:189] "GET /category.screen?category_id=FLOWERS&JSESSIONID=5D55L9FF1ADFF3 HTTP 1.1" 200 3865 "http://buttercup-shopping.com/cart.do?action=remove&itemId=EST-18" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_2) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/44.0.2403.150 Safari/537.36"