Travelling in time with Splunk

How to deal with different time zones in global enterprises

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Forward-Looking Statements

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splunk> .conf18

About me

Splunk Professional Services Consultant and Instructor

- Working with Splunk since 2011
- Started as customer (Vodafone Germany, Telco)
- Delivering Splunk Professional services across EMEA since 2014
- Delivering Splunk training in Germany for 3 years
- Presented at .conf2013 and several Splunk Live! events

Contents

Topics of this presentation

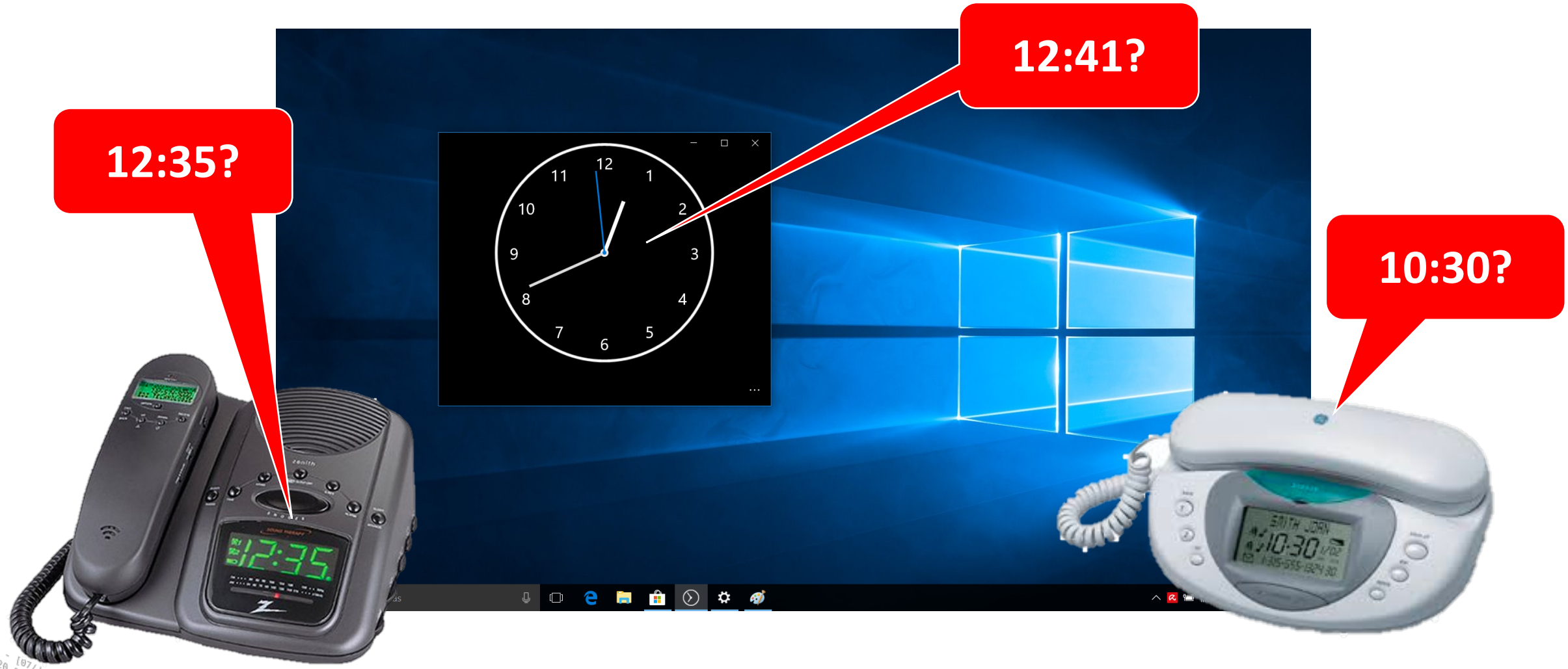
- About time zones
- How Splunk detects time stamp and time zone
- Ingest data without or including a proper time zone configuration
- Add time zone information to raw events
- Using time in searches

About time zones

Why you should care about time zones

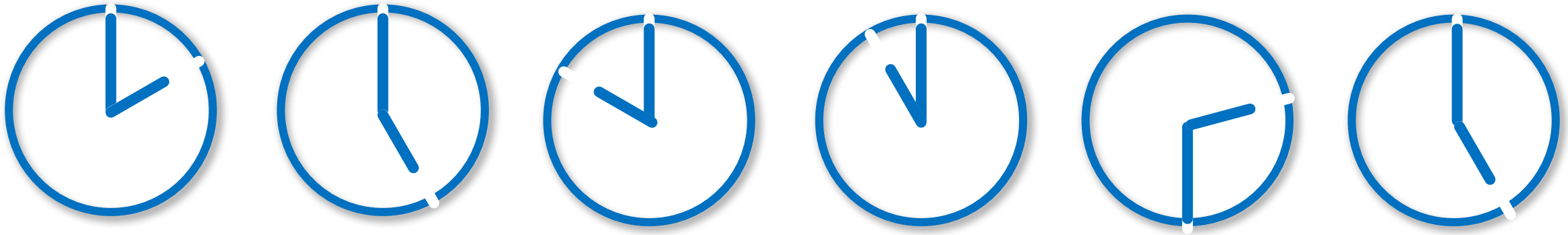
Recently, at customer's office

Time lottery



Time zones in global companies

Just an example



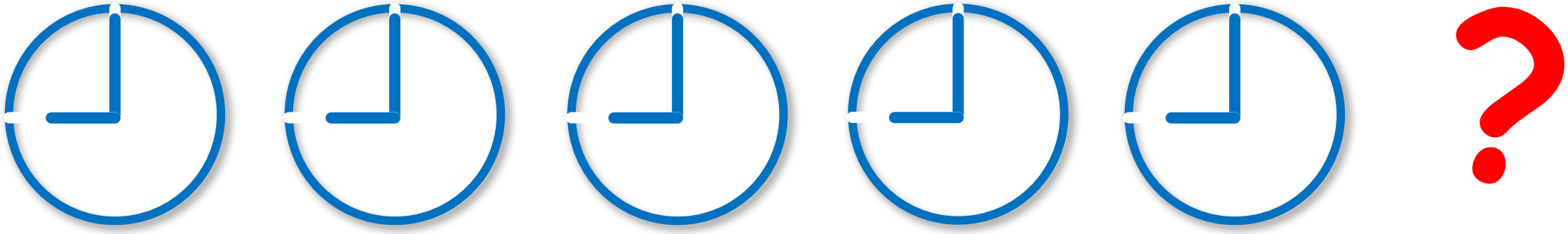
San Francisco	New York	London	Frankfurt	New Delhi	Shanghai
2:00	5:00	10:00	11:00	14:30	17:00
2 AM	5 AM	10 AM	11 AM	2:30 PM	5 PM

- Different time zones in regions like AMER, EMEA, APAC, different time zones within countries
  - 4 main TZ in USA – EST, CST, MST and PST
  - 11 in Russia – only 9 between 2010 and 2014
  - 12 time zones in France – world champion not only in football!
- Time zones with 30 minutes shift like India
- Time zones with / without daylight savings, daylight saving switches on different days (New York: 11-MAR-2018 to 04-NOV-2018, London 25-MAR-2018 to 28-OCT-2018)

Why do we care?

My whole world is UTC

Admin's dirty hack to ignore time zone existence



San Francisco	New York	London	Frankfurt	New Delhi
2:00	5:00	10:00	11:00	14:30
2 AM	5 AM	10 AM	11 AM	2:30 PM

- Creating wrong timestamps in logs by intention
- Very likely not all systems can be set up like this

splunk> .conf18

How Splunk detects time stamp and time zone

Every event in Splunk needs a bit of time, please!

splunk> .conf18

Refresher: how Splunk detects time stamp

Happens after line breaking, before transforms etc.

- Time stamp found in event with time AND date
  1. Use rules in props.conf defined for host, source, sourcetype (note precedence)

```
2018-Oct-03 10:00:00 CEST started scanning for client malware
  scanned device XHT765RT4: no malware found, status OK (12)
  scanned device KJU87RT5H: malware found, status critical (34)
  scanned device KU876RTH6: no malware found, status OK (12)

2018-Oct-03 10:35:00 CEST started scanning for server malware
  scanned device HT75RE$Z6: no malware found, status OK (12)
  scanned device KIU98H7ZM: malware found, status critical (34)
  scanned device ML098UZT7: no malware found, status OK (12)
```

  7. Use system time of indexer
- Store time stamp in epoch / Unix format including milliseconds (if available)

Recommendation: Always define time extraction

Will reduce errors, will increase performance

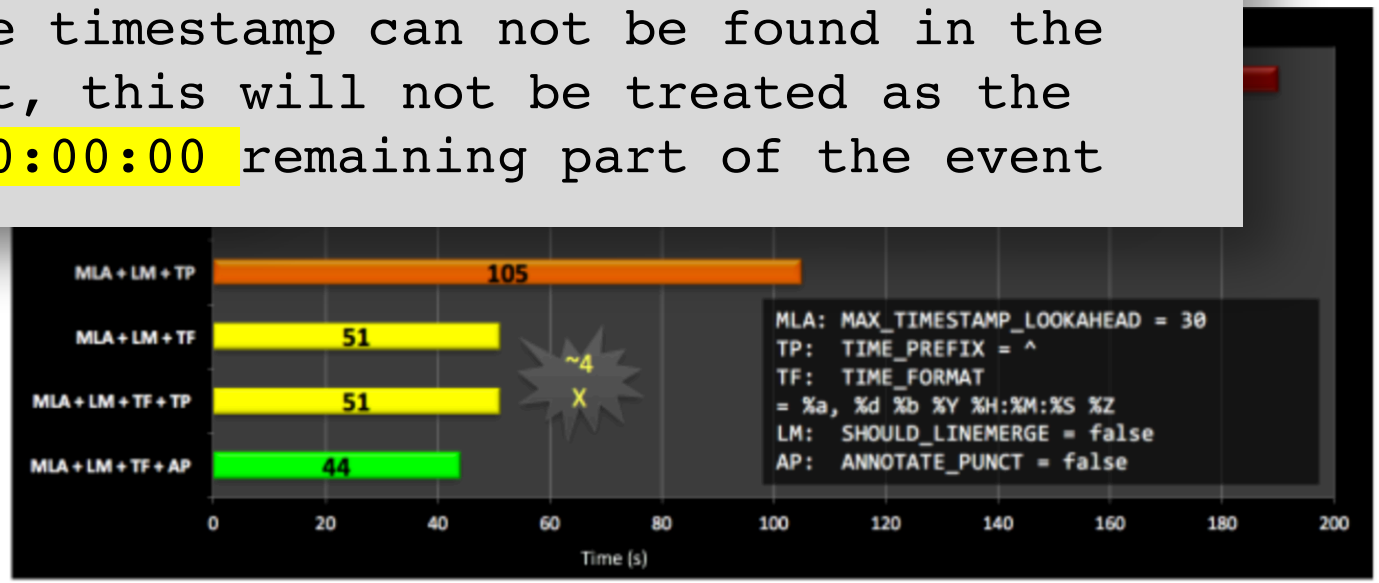
- TIME_PREFIX

```
2018-Oct-03 10:00:00 here is a simple event

Oct 03 10:05:00 syslog1 [code] 2018-Oct-03 10:00:00 original event

Here is another event, where the timestamp can not be found in the
first 128 characters. By default, this will not be treated as the
time of the event 2018-Oct-03 10:00:00 remaining part of the event
```

  - Default 128
  - Critical in case time stamp is far away from event start
- TIME_FORMAT
  - What is the human readable format of the time stamp (strftime abbreviations)
  - Critical in case of unusual formats



How Splunk detects time zone

And what if no time zone information is available?

- Use the time zone in event (for example, PST, -0800)
- Use the TZ attribute set in props.conf, if the event matches the host, source, or sourcetype that the stanza specifies.
- Use the time zone of Forwarder (Splunk version 6.x)
- Use the time zone of the host that indexes the event

```
2018-Oct-03 10:00:00 PST here is a simple event with time zone info
```

```
[host::sf-server*]
TZ = PST

[host::ny-server*]
TZ = EST
```

Ingest data with or without time zone configuration

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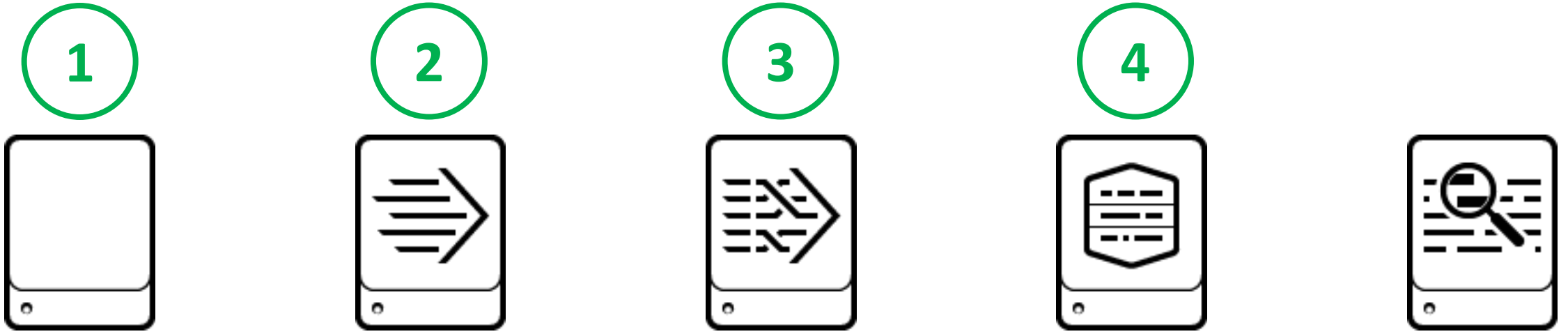
Demo: ingest data without time zone

What happens in the processing chain?



San Francisco Application Server

New York Log Server with UF

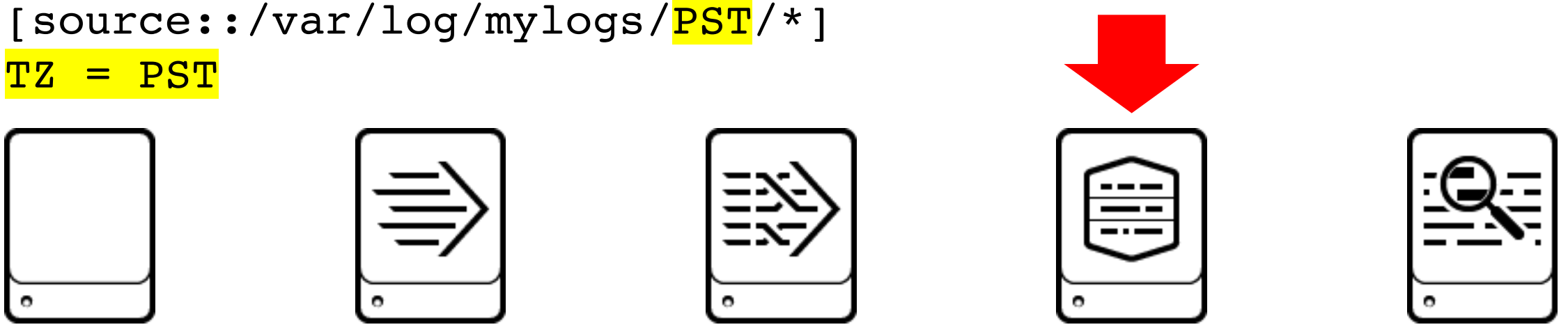
London Heavy Forwarder

Frankfurt Indexer

New Delhi Search Head

Configure time zone in props.conf

```
props.conf:
[source::/var/log/mylogs/PST/*]
TZ = PST
```



San Francisco Application Server

New York Log Server with UF

London Heavy Forwarder

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Repeat demo: ingest data without time zone

San Francisco Application Server

New York Log Server with UF

London Heavy Forwarder

Frankfurt Indexer

New Delhi Search Head

Bonus: Configure time zone for Splunk DB connect

- Splunk DB connect does not take care about TZ settings in props.conf
- Instead, configure time zone for each DB connection separately

db_connections.conf

```
timezone = <time zone identifier>
# optional, default uses JVM time zone
# The identifier could be:
# an offset from UTC/Greenwich, that uses the same offset
  regardless given date-time e.g. +08:00
# an area where a specific set of rules for finding the offset
  from UTC/Greenwich apply e.g. Europe/Paris.
```

splunk> .conf18

Add time zone information to raw events

splunk> .conf18

Add time and time zone using unarchive_cmd

Suitable for static files

- Some applications generate a single file per message (e.g. XML)
- File content has no time information, but file name has date and time
- Splunk cannot retrieve time from file name (source)

inputs.conf

```
[monitor:///var/log/incomingData]
index = null

[batch:///var/log/modifiedData]
index = main
sourcetype = modifiedlogs
move_policy = sinkhole
```

props.conf

```
[source::/var/log/incomingData/*]
invalid_cause = archive
unarchive_cmd = /path/to/TimestampFromFilename.sh

[modifiedlogs]
TIME_PREFIX=^
MAX_TIMESTAMP_LOOKAHEAD = 24
LINE_BREAKER = [\r\n]+
SHOULD_LINEMERGE = false
TIME_FORMAT = %Y-%m-%dT%H:%M:%S.%3N
```

Add time and time zone using unarchive_cmd

- Script Source Code Included in the Appendix slides

```
#!/bin/bash

# Loop over incoming directory
for file in "/var/log/incoming"/*.xml; do

    # Extract the timestamp
    timestamp=$(echo "$file" | sed -n 's/.*\([[:digit:]]\{17\}\).*/\1/p')

    # Format timestamp into Year-Month-Day Hour:Minute:Second.Subsecond
    timestamp="${timestamp:0:4}-${timestamp:4:2}-${timestamp:6:2}
${timestamp:8:2}:${timestamp:10:2}:${timestamp:12:2}.${timestamp:14:3}"

    # Add timestamp into each line of the current file
    sed -i -e "s/^/$timestamp - /" $file

    # After modification move the file to the modified directory
    mv $file $dst

done
```

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Add time zone using props and transforms

- Objective: add time zone information into events
- Event before:
  192.168.1.1 [2018-07-26T10:12:34] my log message 200 1234
- Event after:
  192.168.1.1 [2018-07-26T10:12:34 -0700] my log message 200 1234


```
inputs.conf
[splunktcp://9991]
route:has_key:_linebreaker:parsingQueue

props.conf
[source:///var/log/mylogswithouttimezone*]
TRANSFORMS-01=add_time_zone_PST
```

```
transforms.conf
[add_time_zone_PST]
SOURCE_KEY = _raw
DEST_KEY   = _raw
REGEX      = (.*?)\](.*)
FORMAT     = $1 -0700]$2
```

Add time zone using props and transforms

- Objective: add time zone information into events
- Event before:
  192.168.1.1 [2018-07-26T10:12:34] my log message 200 1234
- Event after:
  192.168.1.1 [2018-07-26T10:12:34 -0700] my log message 200 1234


```
inputs.conf
[splunktcp://9991]
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```

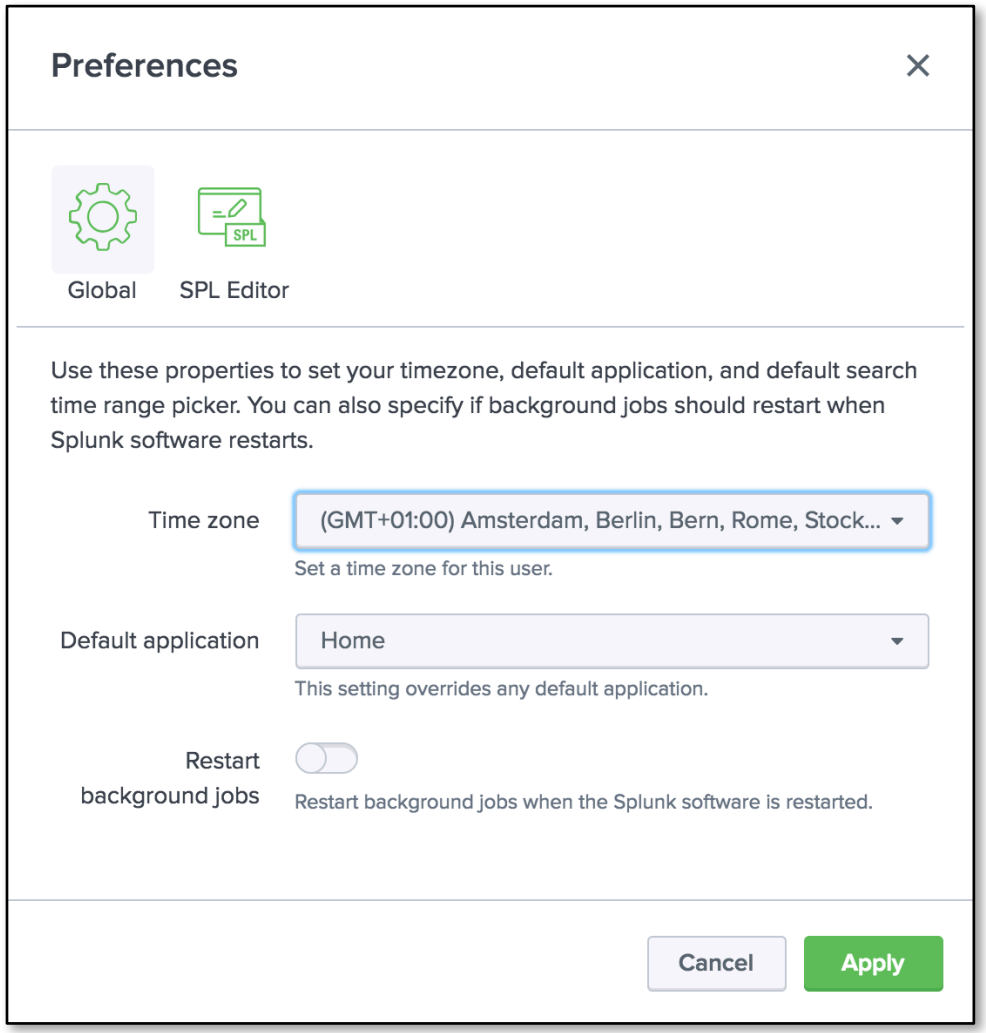
```
transforms.conf
[add_time_zone_PST]
SOURCE_KEY = _raw
DEST_KEY   = _raw
REGEX      = (.*?)\](.*)
FORMAT     = $1 -0700]$2
```

Using time in searches

Searching events in Splunk

Another view on the same events

- Any Splunk search uses time as 2nd important filter (after index)
- Search is related to the user's time zone as defined in Splunk Web preferences (can be different from system time)
- Note that relative historical searches (like "last 24 hours") usually use latest=now(), means results from the future are omitted

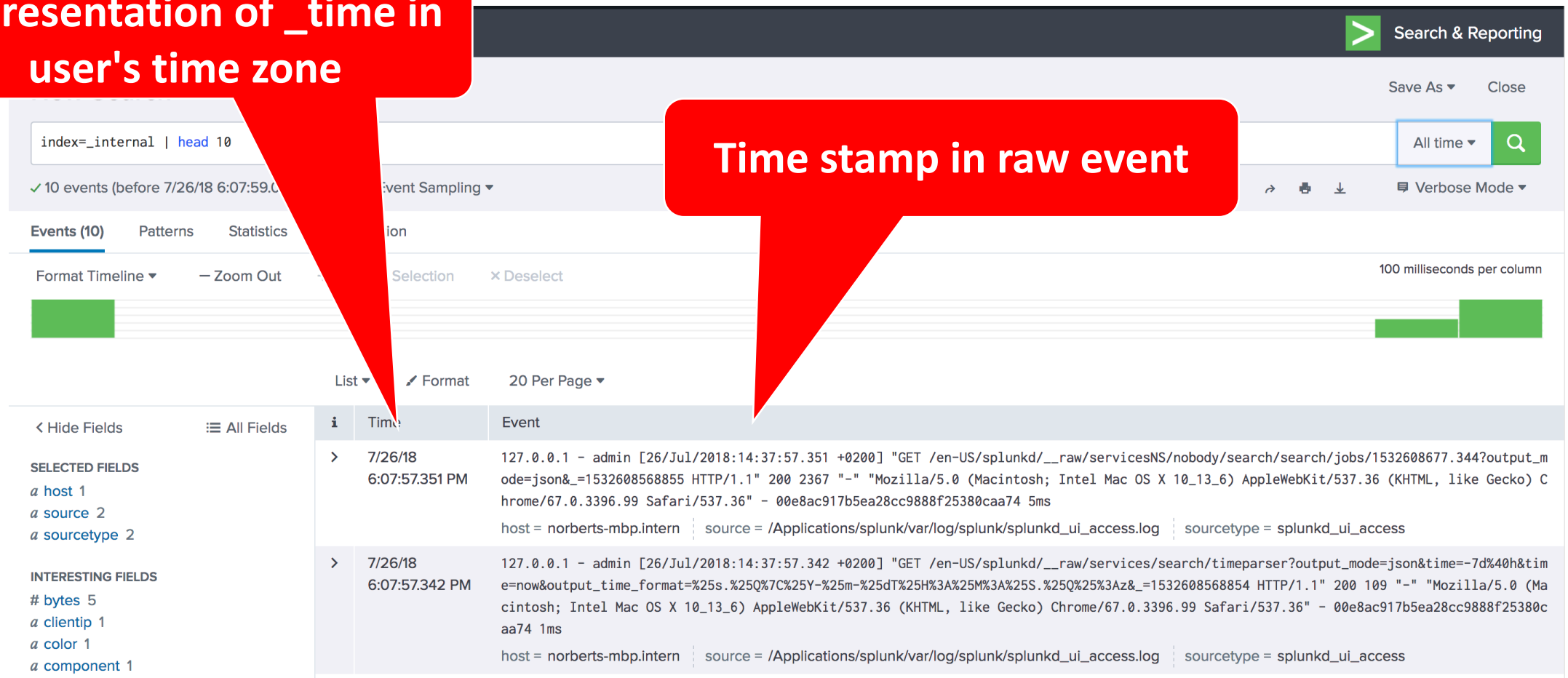


Searching events in Splunk

Another view on the same events

Representation of _time in user's time zone

Time stamp in raw event



Additional time fields

Another view on the same events

- Default time fields
  - date_second, date_minute, date_hour, date_wday, date_mday, date_month, date_year, date_zone
  - Generated at index time and stored in tsidx (check with `walklex` command)
  - Only for events having human readable time stamps
  - Extracting values from raw events, means without time zone conversion and without any other changes (props+transforms)
  - Does NOT reflect time zone of user when searching
- Index time (_indextime)
  - Epoch / Unix format without milliseconds
  - Can be used to determine indexing delay and / or time zone issues

How to search in another time zone

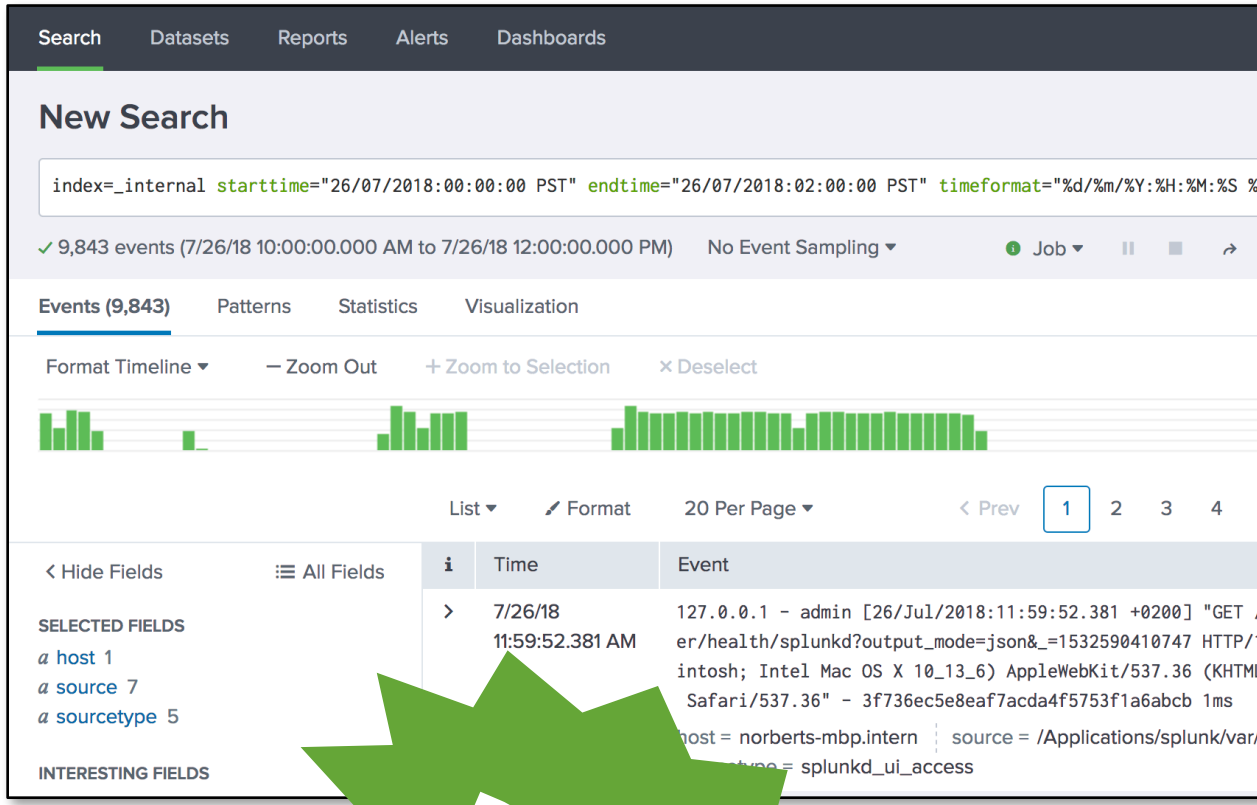
- Set time zone in preferences to the target time zone

- Use starttime and endtime for searches instead of earliest and latest
- Use the macro provided in this break out session
- Create dashboard with time zone selectors

Use starttime and endtime

- By default we use earliest and latest in searches
- You can enter human readable times here, but only in fixed format `%m/%d/%Y:%H:%M:%S`
- Alternatively, we can use starttime and endtime, which allows other formats including time zones:

```
index=_internal
starttime="26/07/2018:00:00:00 PST"
endtime="26/07/2018:02:00:00 PST"
timeformat="%d/%m/%Y:%H:%M:%S %Z"
```



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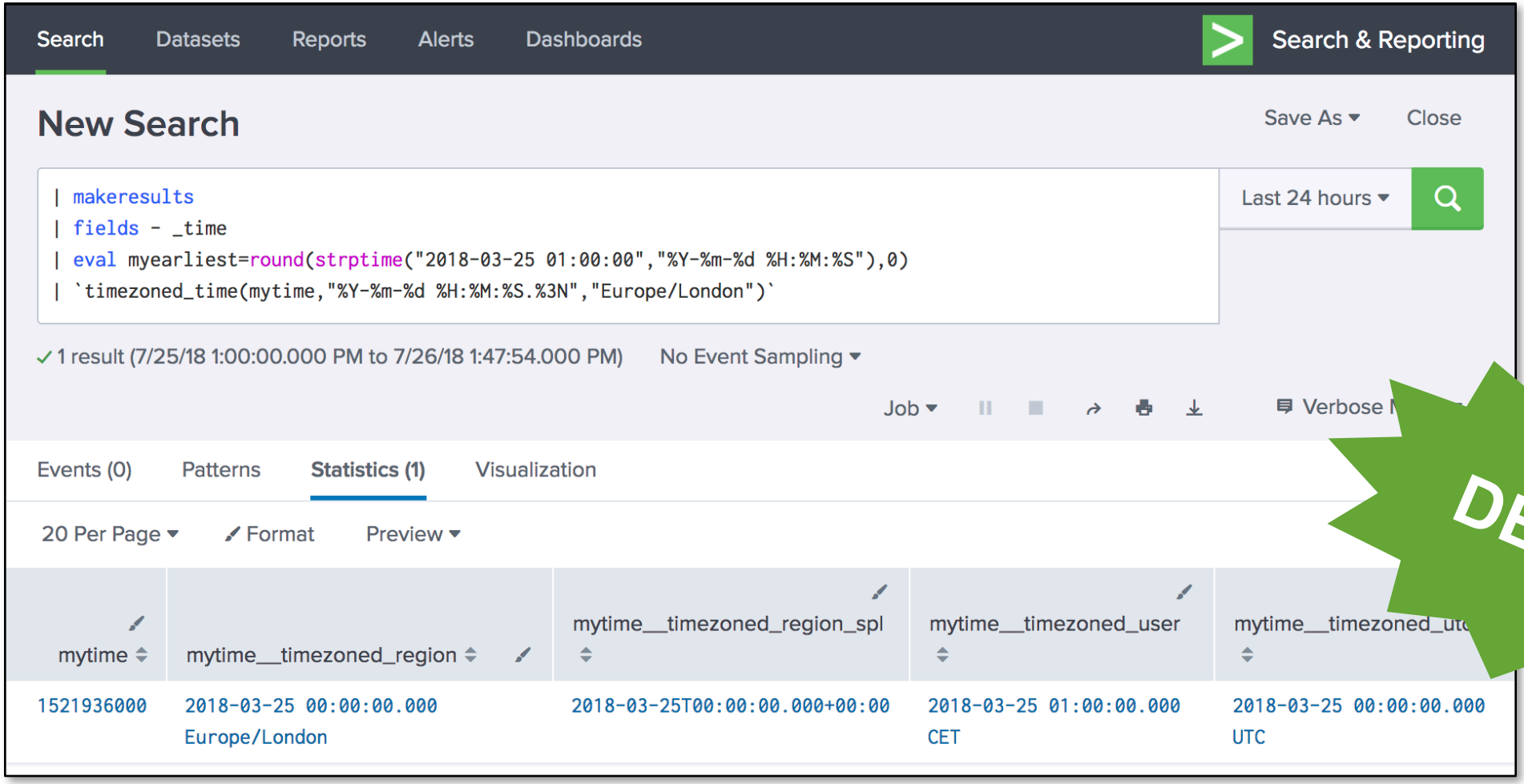
Macro to convert times in different time zone

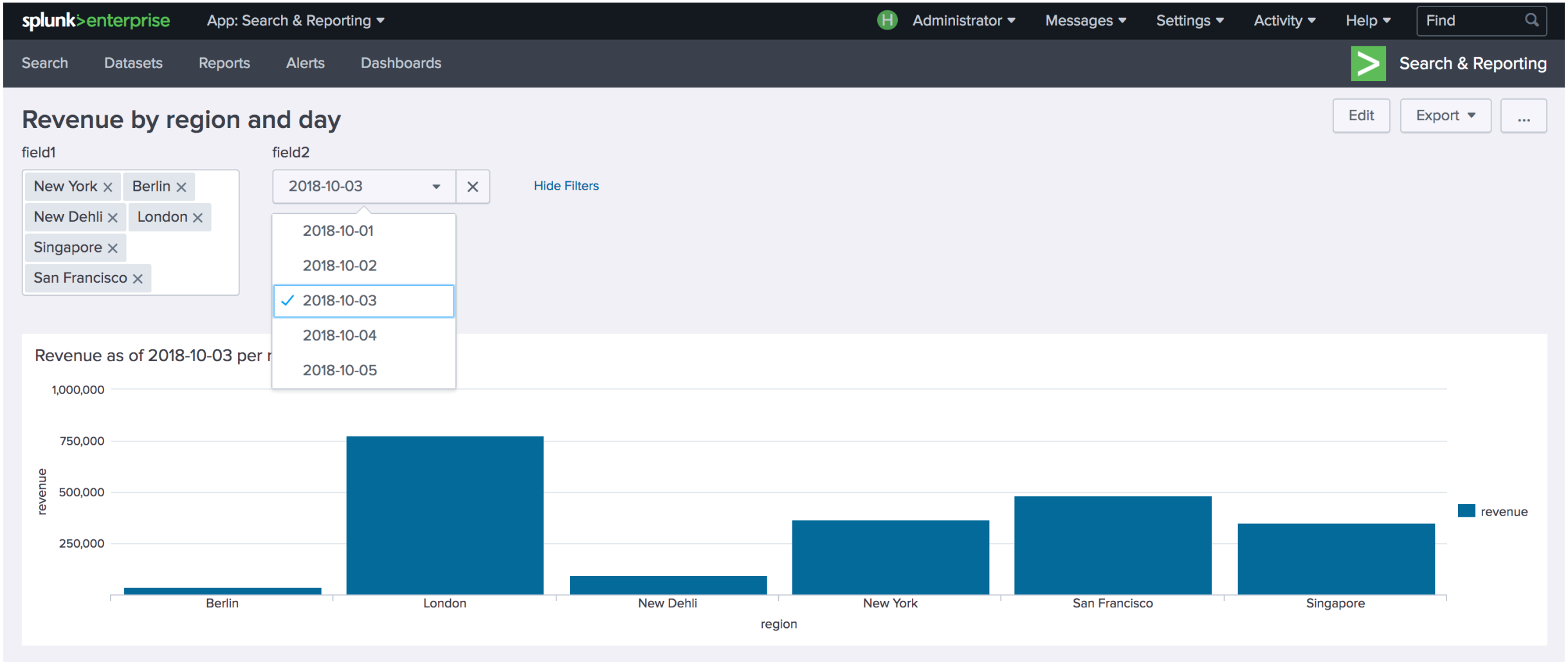
Code provided in appendix



splunk> .conf18

Why do we care?

Dashboard with custom time zone selectors



Thank You

Don't forget to rate this session in the .conf18 mobile app

Appendix

Add time and time zone using unarchive_cmd

Script source code

```
#!/bin/bash

# Loop over incoming directory
for file in "/var/log/incoming"/*.xml; do

    # Extract the timestamp
    timestamp=$(echo "$file" | sed -n 's/.*\([[:digit:]]\{17\}\).*/\1/p')

    # Format timestamp into Year-Month-Day Hour:Minute:Second.Subsecond
    timestamp="${timestamp:0:4}-${timestamp:4:2}-${timestamp:6:2}
       ${timestamp:8:2}:${timestamp:10:2}:${timestamp:12:2}.${timestamp:14:3}"

    # Add timestamp into each line of the current file
    sed -i -e "s/^/$timestamp - /" $file

    # After modification move the file to the modified directory
    mv $file $dst

done
```

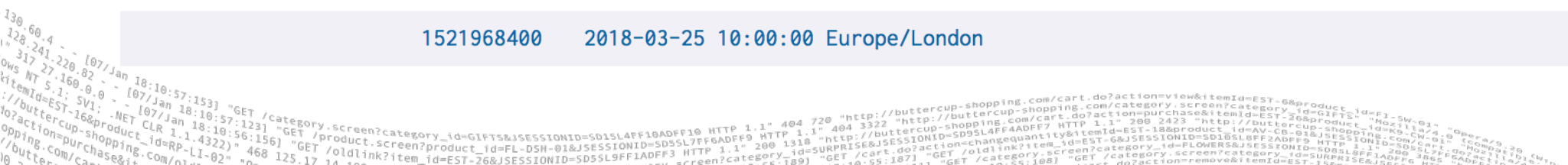
How Splunk detects year, if missing

Sub title

- Get either the date of the last event current system time
- Perform some logical checks
- Assign the year to the time stamp
- Check if that falls into the allowed time range (MAX_DAYS_AGO – 2000 days, MAX_DAYS_HENCE – 2 days)
- Examples:
  - New event with time stamp 26 Jun retrieved on May 26, 2017 will end up as 26-JUN-2016
  - New event with time stamp 10 Apr retrieved on May 26, 2017 will end up as 10-APR-2018, which is outside of the allowed range, therefore the current date 26-MAY-2017 is used

Time shift during DST switch

timestamp	timestring	delta
1521921600	2018-03-24 20:00:00 Europe/London	3600
1521925200	2018-03-24 21:00:00 Europe/London	3600
1521928800	2018-03-24 22:00:00 Europe/London	3600
1521932400	2018-03-24 23:00:00 Europe/London	3600
1521936000	2018-03-25 00:00:00 Europe/London	3600
1521939600	2018-03-25 02:00:00 Europe/London	3600
1521943200	2018-03-25 03:00:00 Europe/London	3600
1521946800	2018-03-25 04:00:00 Europe/London	3600
1521950400	2018-03-25 05:00:00 Europe/London	3600
1521954000	2018-03-25 06:00:00 Europe/London	3600
1521957600	2018-03-25 07:00:00 Europe/London	3600
1521961200	2018-03-25 08:00:00 Europe/London	3600
1521964800	2018-03-25 09:00:00 Europe/London	3600
1521968400	2018-03-25 10:00:00 Europe/London	3600



splunk> .conf18

Macro to convert times in different time zone

```
eval _ma_dateformat="$target_timeformat$"
| eval _ma_locTZ="$target_timezone$"
| eval _ma_timestamp=$utc_timestamp$
| eval _ma_usrTime=strftime(_ma_timestamp, _ma_dateformat." %Z")
| eval _ma_utcTime=strftime(_ma_timestamp - (strptime(strftime(_ma_timestamp, _ma_dateformat."Z"),
_ma_dateformat."%Z")-strptime(strftime(_ma_timestamp, _ma_dateformat), _ma_dateformat)), _ma_dateformat." UTC")
| eval _ma_locTime=strftime(2*_ma_timestamp - strptime(strftime(_ma_timestamp, _ma_dateformat."
"._ma_locTZ),_ma_dateformat." %Z"),_ma_dateformat)." "._ma_locTZ
| eval _ma_locOffsetSec=strptime(_ma_locTime,_ma_dateformat)-strptime(_ma_utcTime,_ma_dateformat)
| eval _ma_locOffsetNot=round(_ma_locOffsetSec/3600,2), _ma_locOffsetNot=if(_ma_locOffsetSec <
0,_ma_locOffsetNot,"+"._ma_locOffsetNot)
| rex field=_ma_locOffsetNot "^(?<_ma_rexP>\+|-)(?<_ma_rexH>\d+)\.(?<_ma_rexM>\d+)$"
| eval _ma_rexM=if(_ma_rexM>0,60*(_ma_rexM/100),_ma_rexM)
| eval _ma_rexH=if(len(_ma_rexH)<2,"0"._ma_rexH,_ma_rexH)
| eval _ma_locOffsetNot=_ma_rexP._ma_rexH.":"._ma_rexM
| eval _ma_locTimeSPL=strftime(strptime(_ma_locTime,_ma_dateformat),"%Y-%m-%dT%H:%M:%S.%3Q"._ma_locOffsetNot)
| rename _ma_usrTime AS "$utc_timestamp$__timezoned_user"  _ma_utcTime AS "$utc_timestamp$__timezoned_utc"
_ma_locTime AS "$utc_timestamp$__timezoned_region"  _ma_locTimeSPL AS "$utc_timestamp$__timezoned_region_spl"
| fields - _ma_*
```

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