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Advanced Scheduling with Splunk to Help Ensure Your Searches Run, Succeed and Cover All Data

PLA1372B

Andrew Smith
Manager Cybersecurity Analytics | Pfizer

Maksim Dubyk
Manager Intrusion Detection & Analysis | Pfizer

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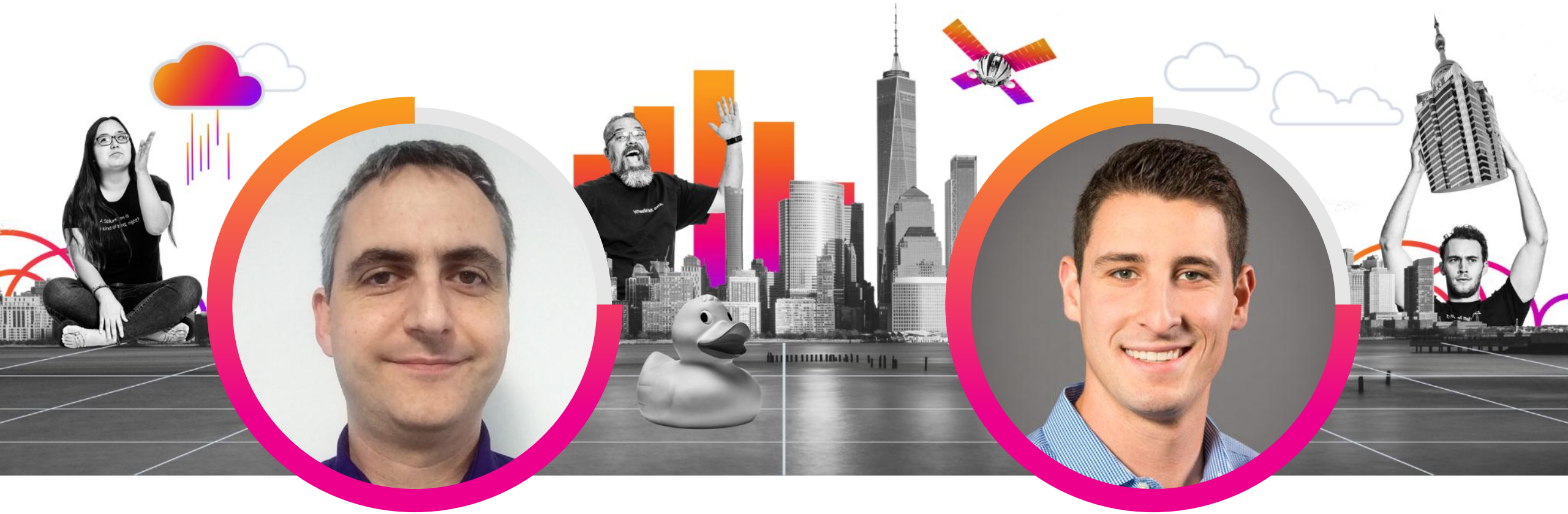

Andrew Smith

Manager Cybersecurity Analytics | Pfizer

Maksim Dubyk

Manager Intrusion Detection & Analysis | Pfizer

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Agenda

1) Alerting Challenges

2) Ineffective Solutions

3) Our Solution: Stateful earliest index time

4) Complex Use Cases with Apache Airflow

5) “So How Do I Get Started?”

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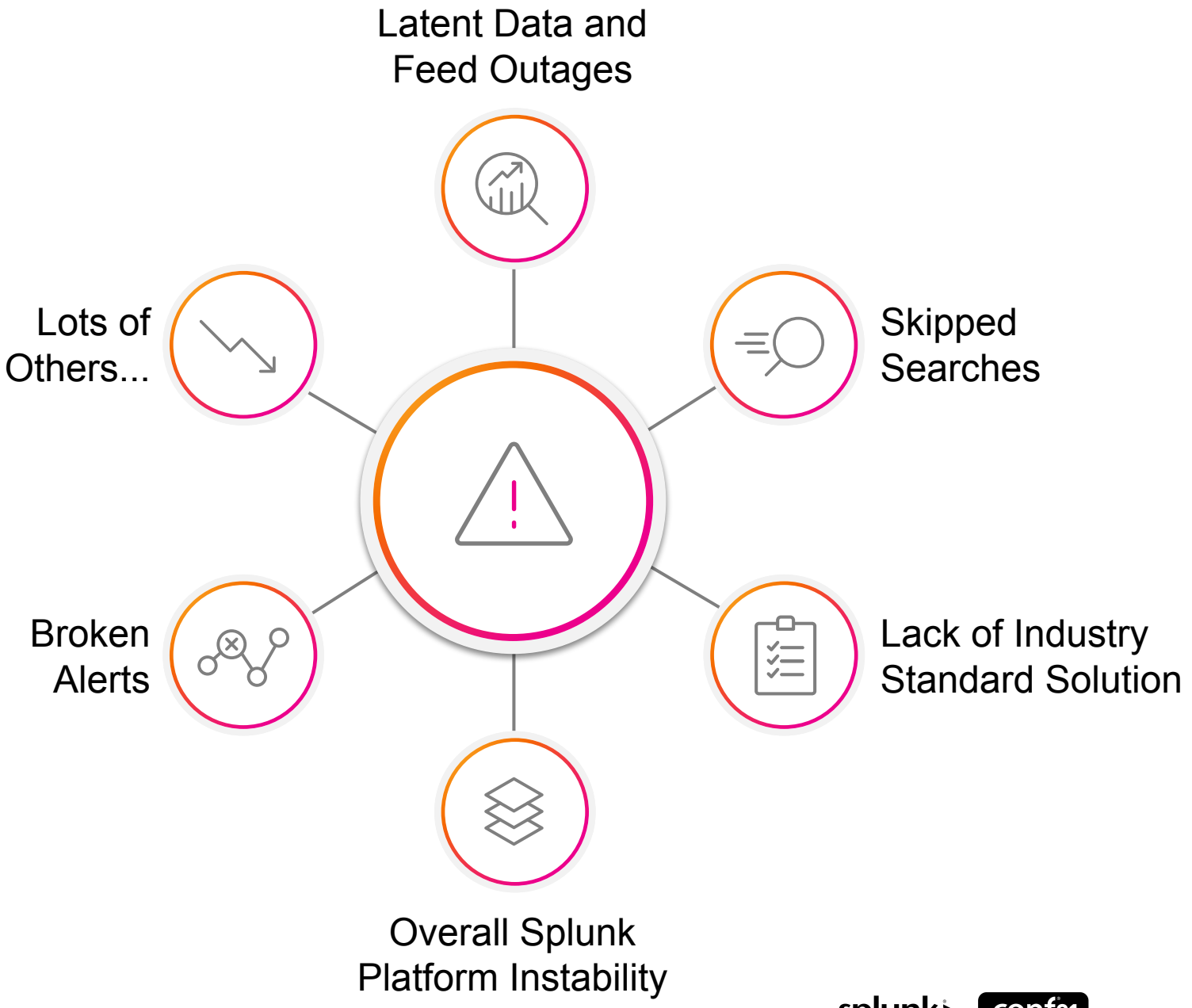
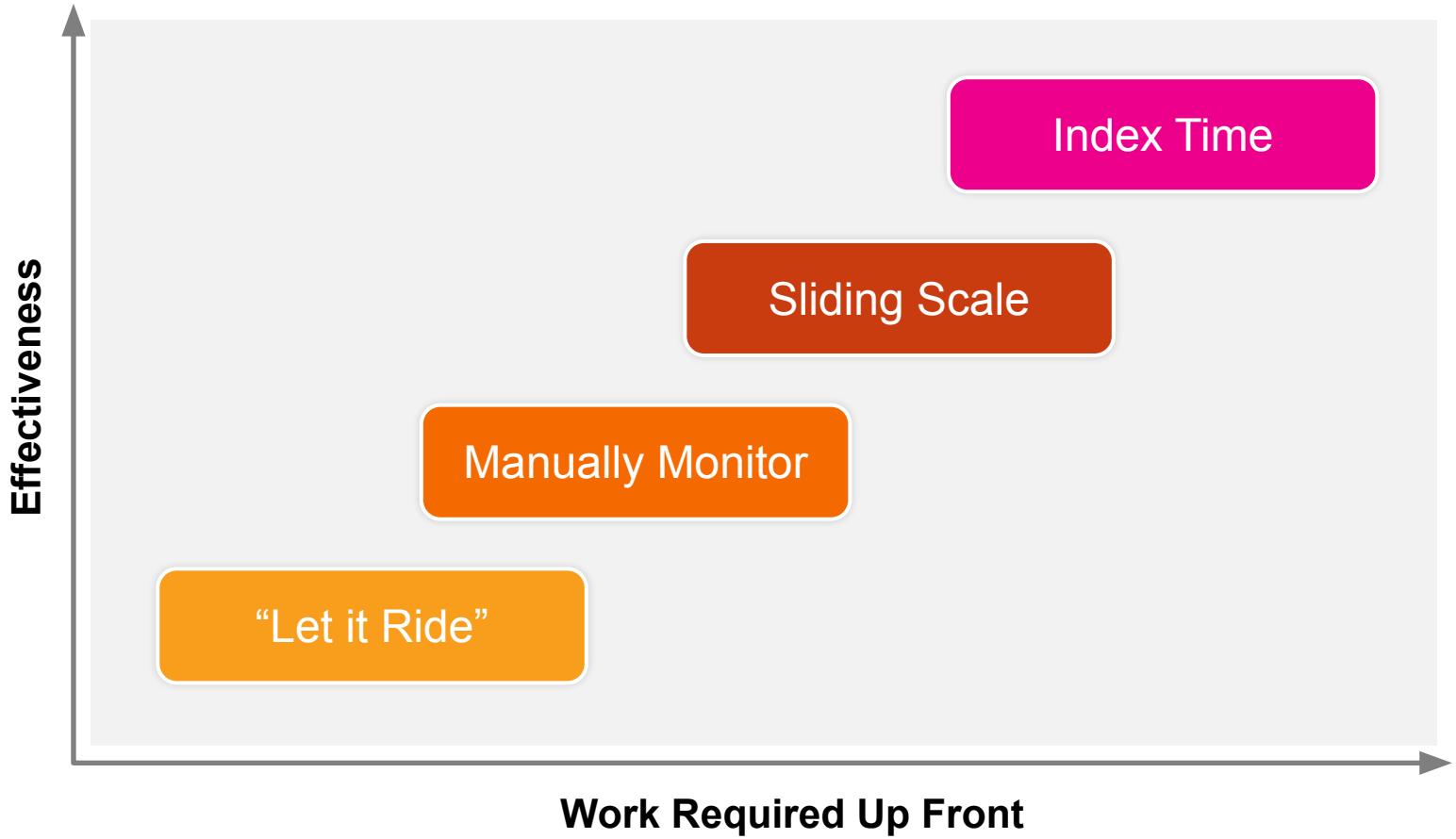
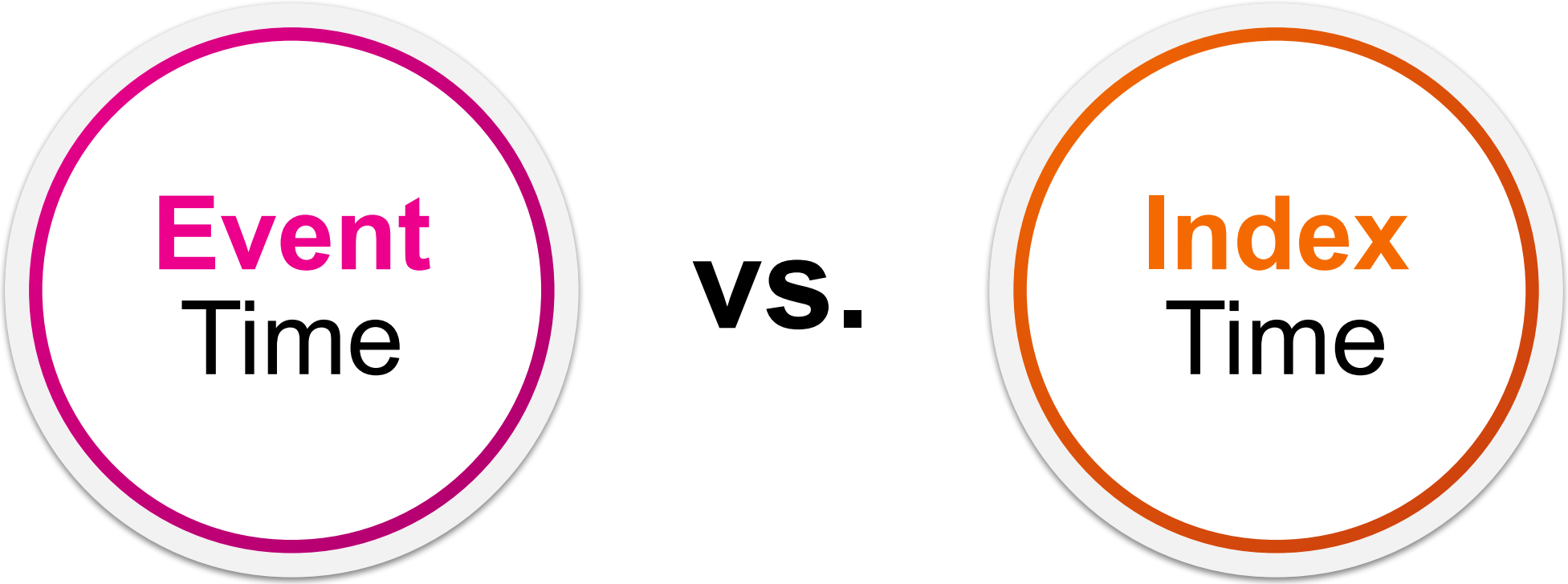
Splunk Alerting Challenges



How do Most People Address These Issues?





The Progression of How to Query

```
index=firewall badness_detected=true
| eval a="bcde"
| ...
```

Last 60 minutes

```
index=firewall badness_detected=true earliest=-1h@h latest=-0h@h
| eval a="bcde"
| ...
```

```
index=firewall badness_detected=true _index_earliest=-1h@h _index_latest=-0h@h
| eval a="bcde"
| ...
```

```
index=firewall badness_detected=true `autotimeframe("The Alert Name")`
| eval a="bcde"
| ...
```

Our Solution

- Uses index time
- Decouple execution time from search time
- KV store records "Last Ran"
- Macro reads and updates "Last Ran"
- Safeguards:
  - Limits maximum search
  - Includes a rolling overlap window
- Manual override for manual re-runs

KV Store

Alert Name	Last Ran
The Alert Name	2021-09-01:10:15:00

Macro

```
[| makeresults
    | fields - _time
    | eval query_name_hash = md5("$query_name$")
    | lookup lastrun _key AS query_name_hash
    | eval last_time = max(coalesce(last_time, relative_time(now(), "-$default_start_lookback$") - 1), relative_time(now(), "-$longest_lookback$"))
    | eval search_to = min(relative_time(now(), "-$realtime_lag$"), relative_time(last_time, "+$longest_query$"))
    | eval search_from = relative_time(last_time, "-$overlap$")
    | eval search = "_index_earliest=".search_from." _index_latest=".search_to." earliest=$event_time_earliest$ latest=$event_time_latest$"
    | appendpipe
        [| eval _key = query_name_hash
        | eval last_time = search_to
        | fields + last_time, _key
        | outputlookup append=t lastrun
        | where 1=2 ]
    | fields + search ]
```

Alert

```
index=firewall badness_detected=true `autotimeframe("The Alert Name")`
| eval a="bcde"
| ...
```

A Look at the Macro

```
[| makeresults
    | fields - _time
    | eval query_name_hash = md5("$query_name$")
    | lookup lastrun _key AS query_name_hash
    | eval last_time = max(coalesce(last_time, relative_time(now(), "-$default_start_lookback$") - 1), relative_time(now(), "-$longest_lookback$"))
    | eval search_to = min(relative_time(now(), "-$realtime_lag$"), relative_time(last_time, "+$longest_query$"))
    | eval search_from = relative_time(last_time, "-$overlap$")
    | eval search = " index earliest=".search_from." index latest=".search_to." earliest=$event_time_earliest$ latest=$event_time_latest$"
    | appendpipe
        [| eval _key = query_name_hash
        | eval last_time = search_to
        | fields + last_time, _key
        | outputlookup append=t lastrun
        | where 1=2 ]
    | fields + search ]
```

Find the last time the named query ran until from the KVStore

Update the KVStore ready for the next execution

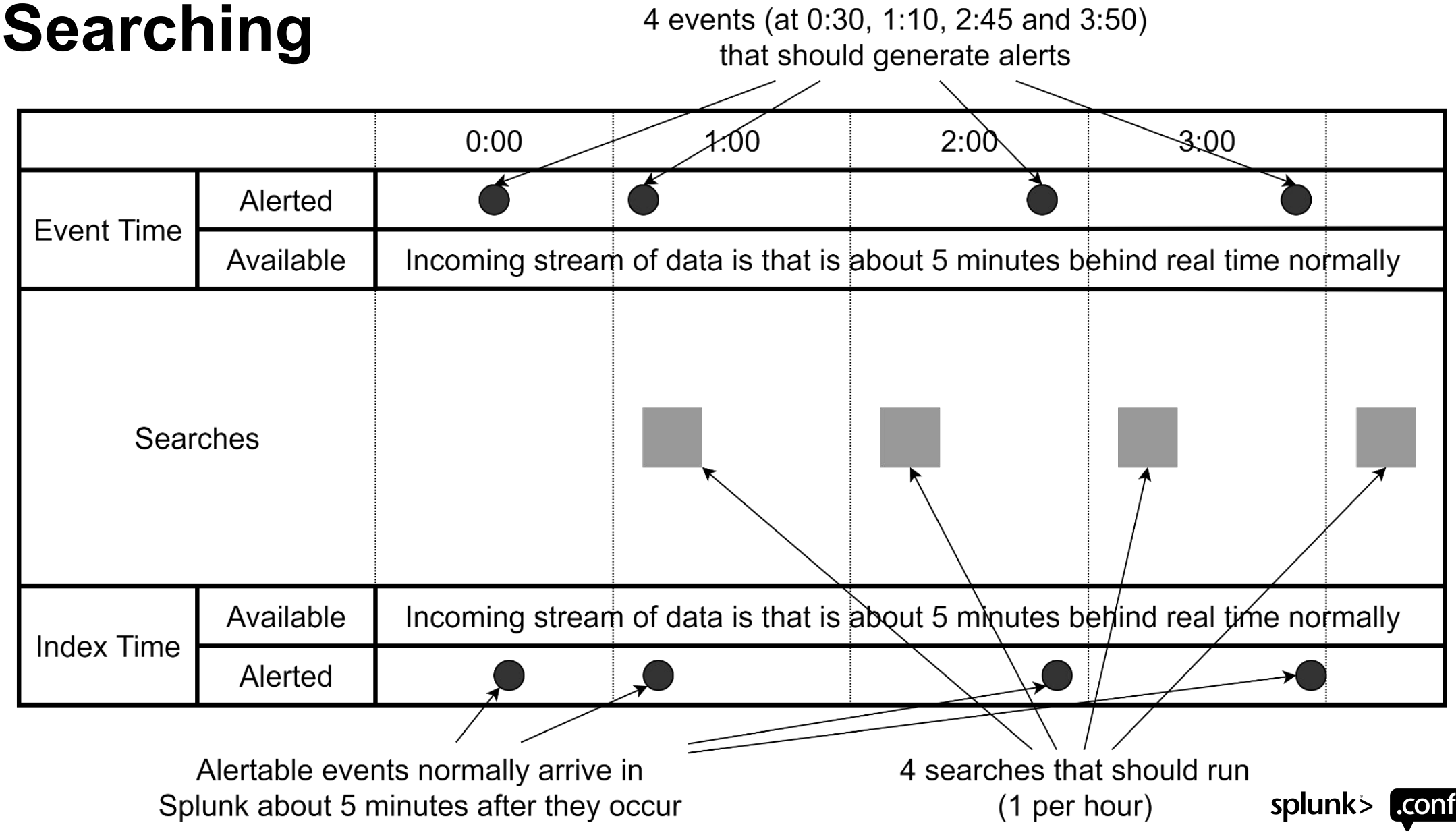
Generate the timeframe to apply to the search

Challenges Addressed

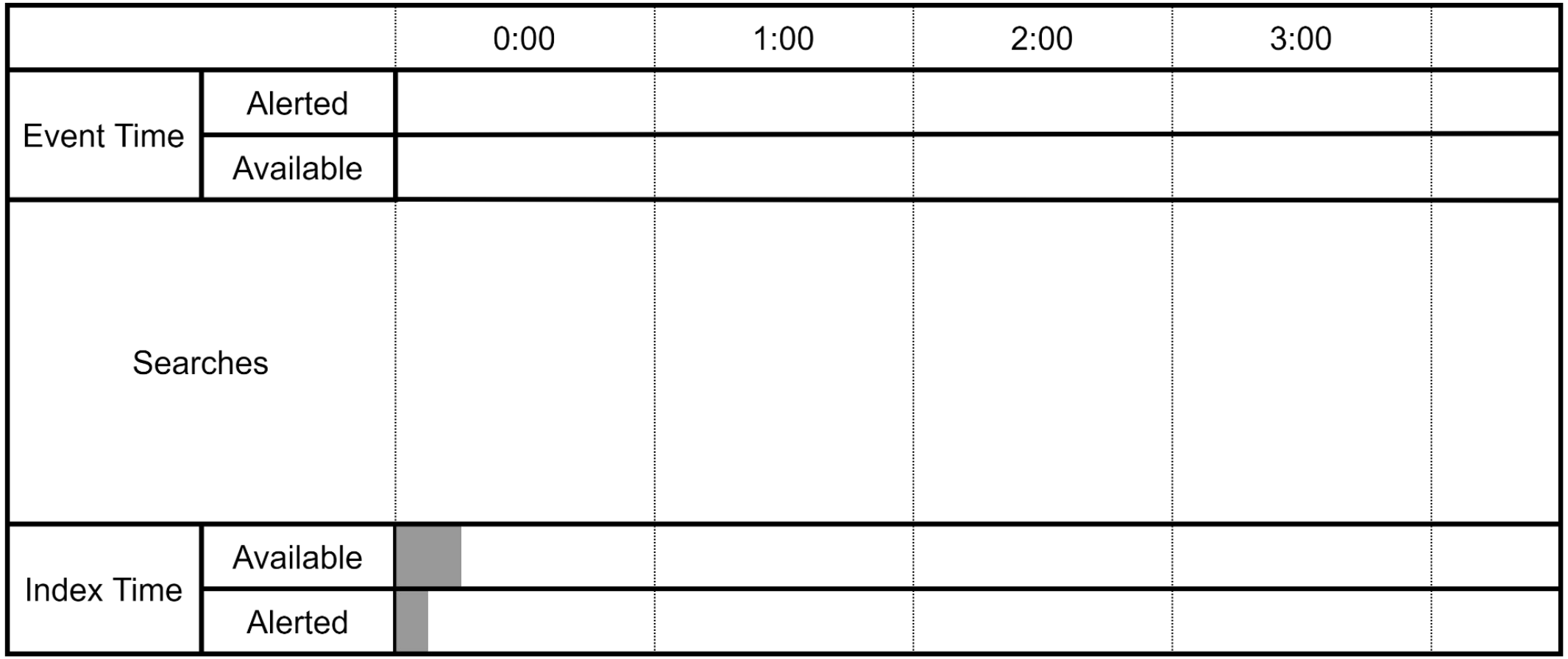
- Latent data that is an hour + behind
- Feed outage stops for 5 hours
- Search head down / skipped searches
- Broken search due to user SPL error

Scenario: Normal Conditions
Time Source: Event Time Searching

Searching



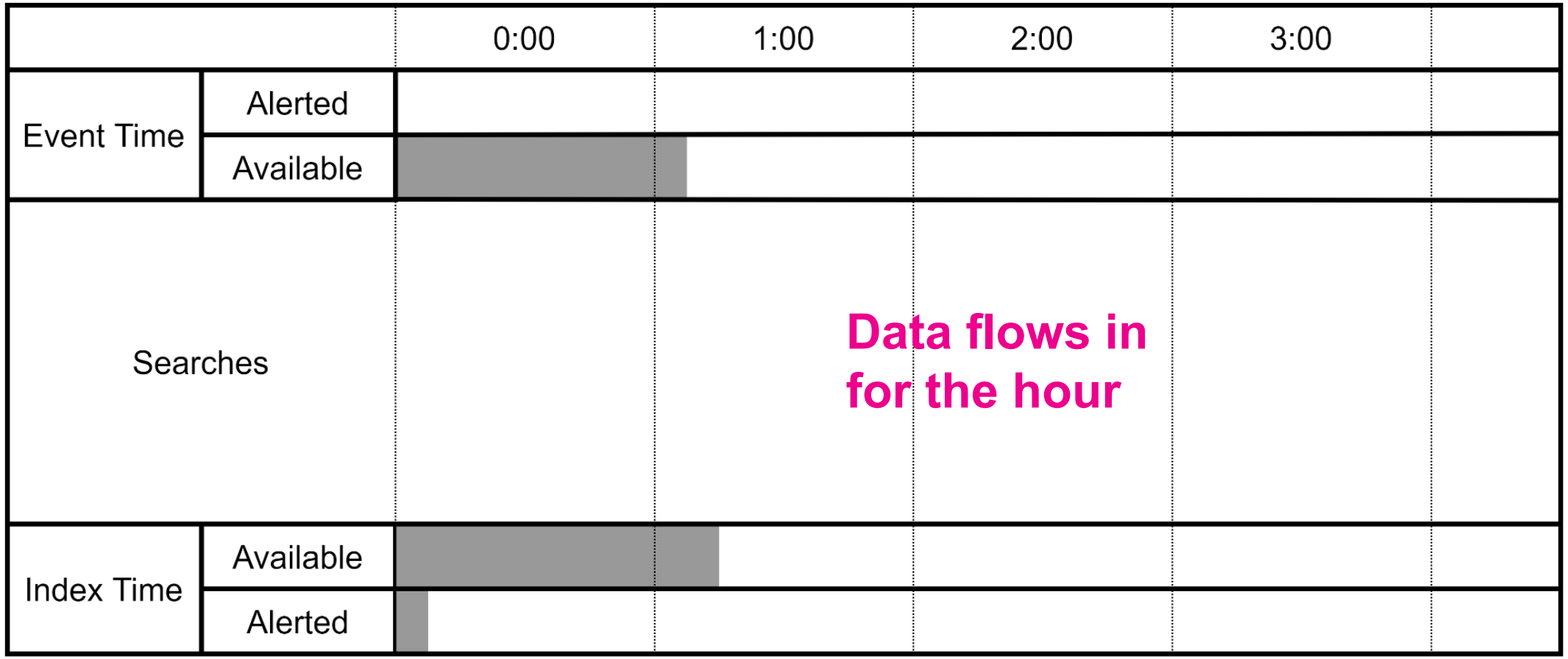
Normal Conditions | Event Time Searching



Time: 00:10

Alerts Raised: 0 of 0

Normal Conditions | Event Time Searching



Time: 01:10

Alerts Raised: 0 of 0

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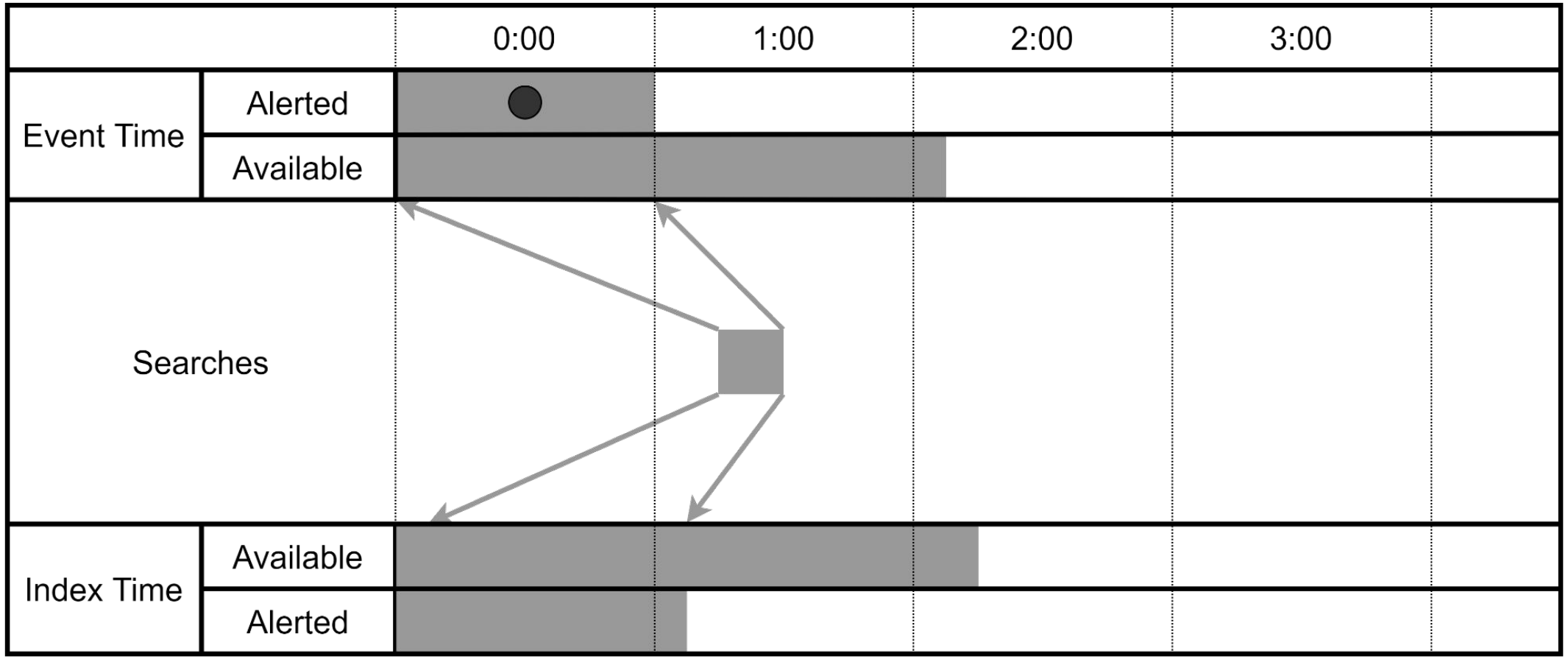
Normal Conditions | Event Time Searching

Time: 00:10

Alerts Raised: 1 of 1

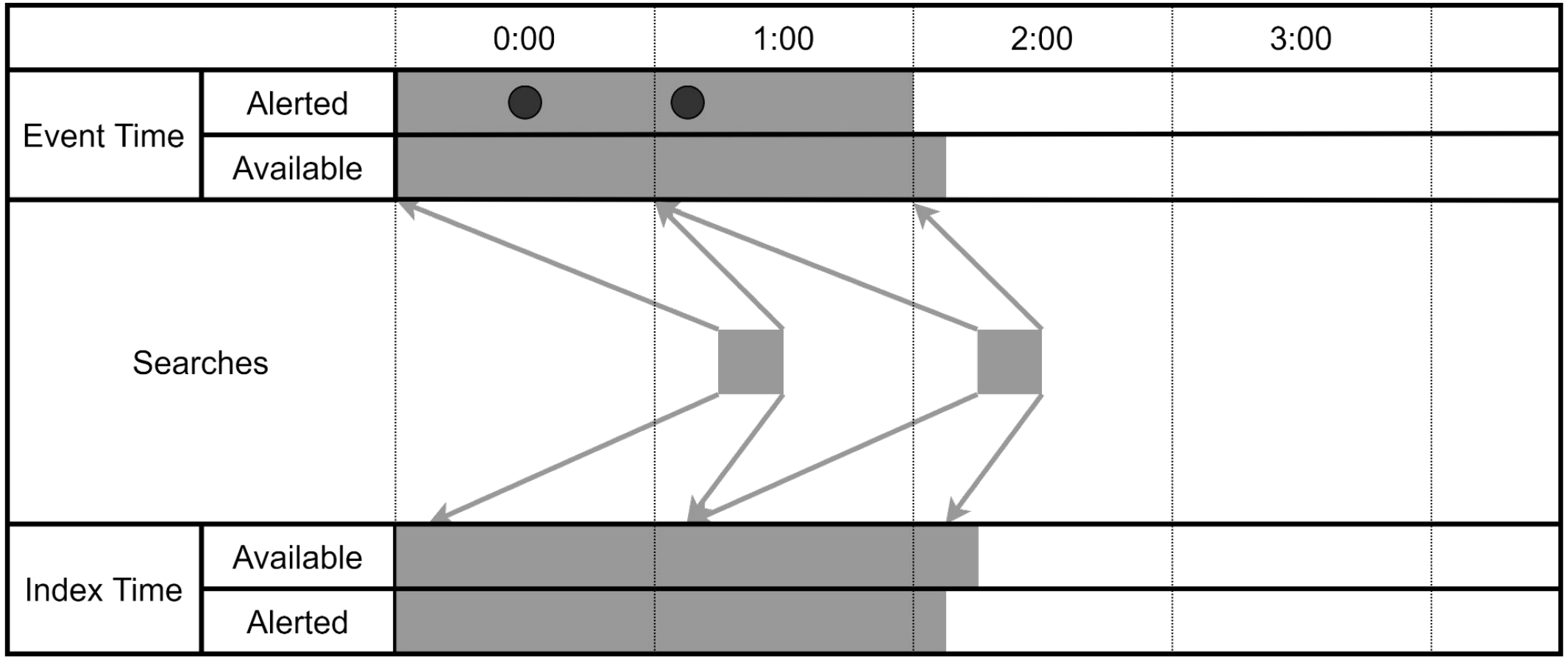
Normal Conditions | Event Time Searching



Time: 02:10

Alerts Raised: 1 of 1

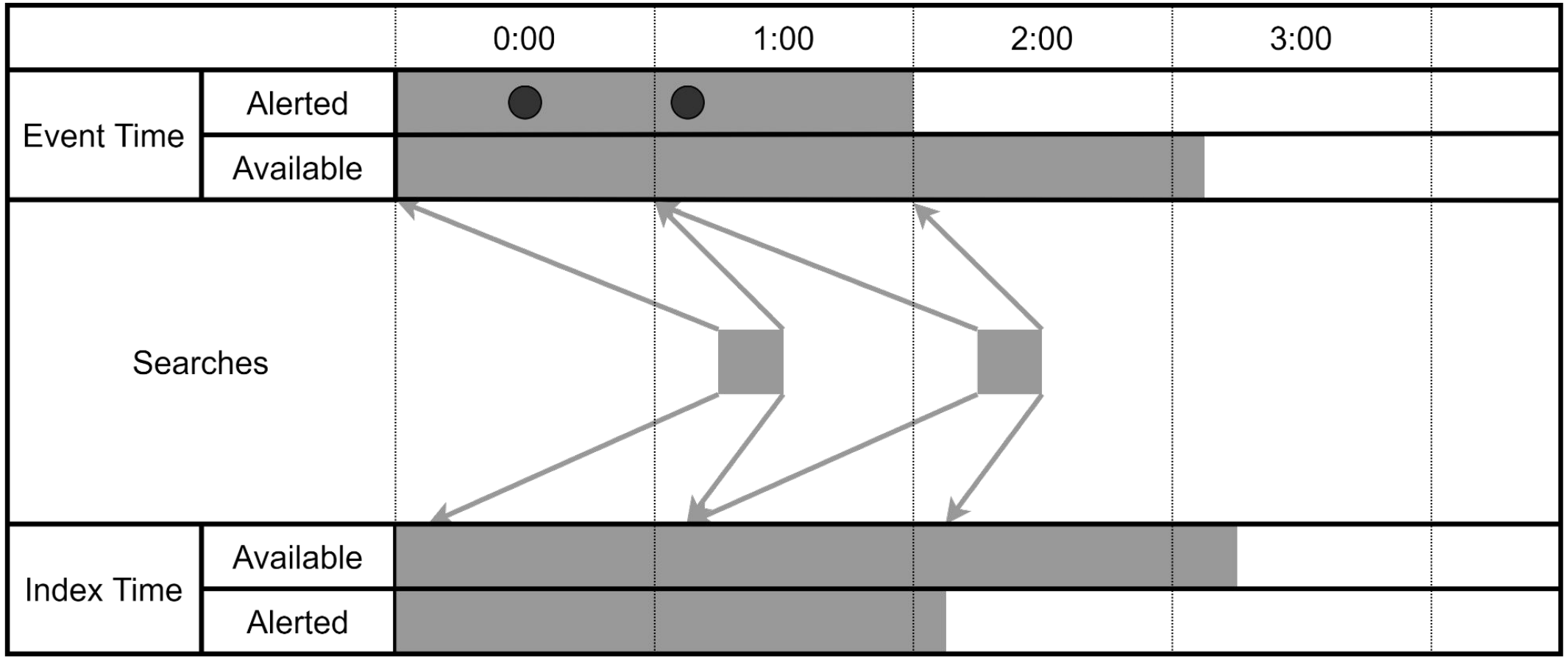
Normal Conditions | Event Time Searching



Time: 02:10

Alerts Raised: 2 of 2

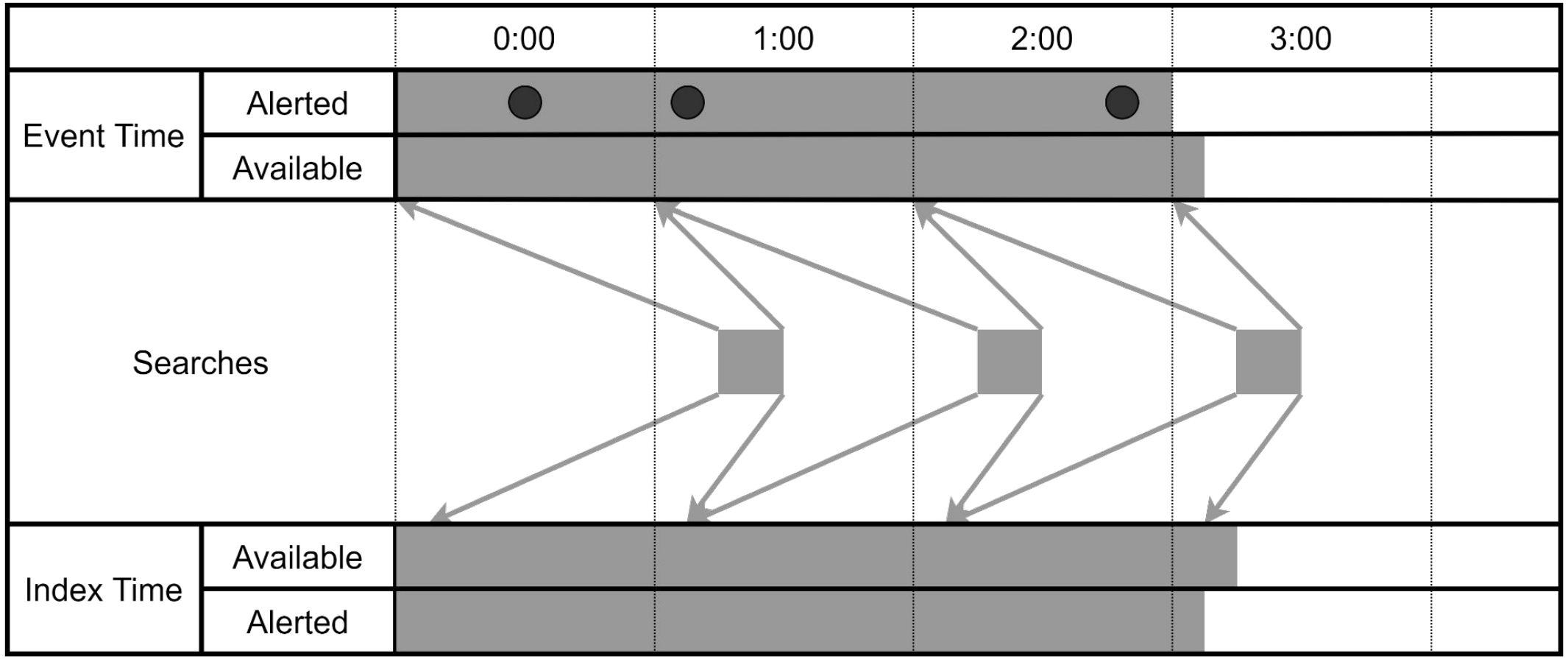
Normal Conditions | Event Time Searching



Time: 03:10

Alerts Raised: 2 of 2

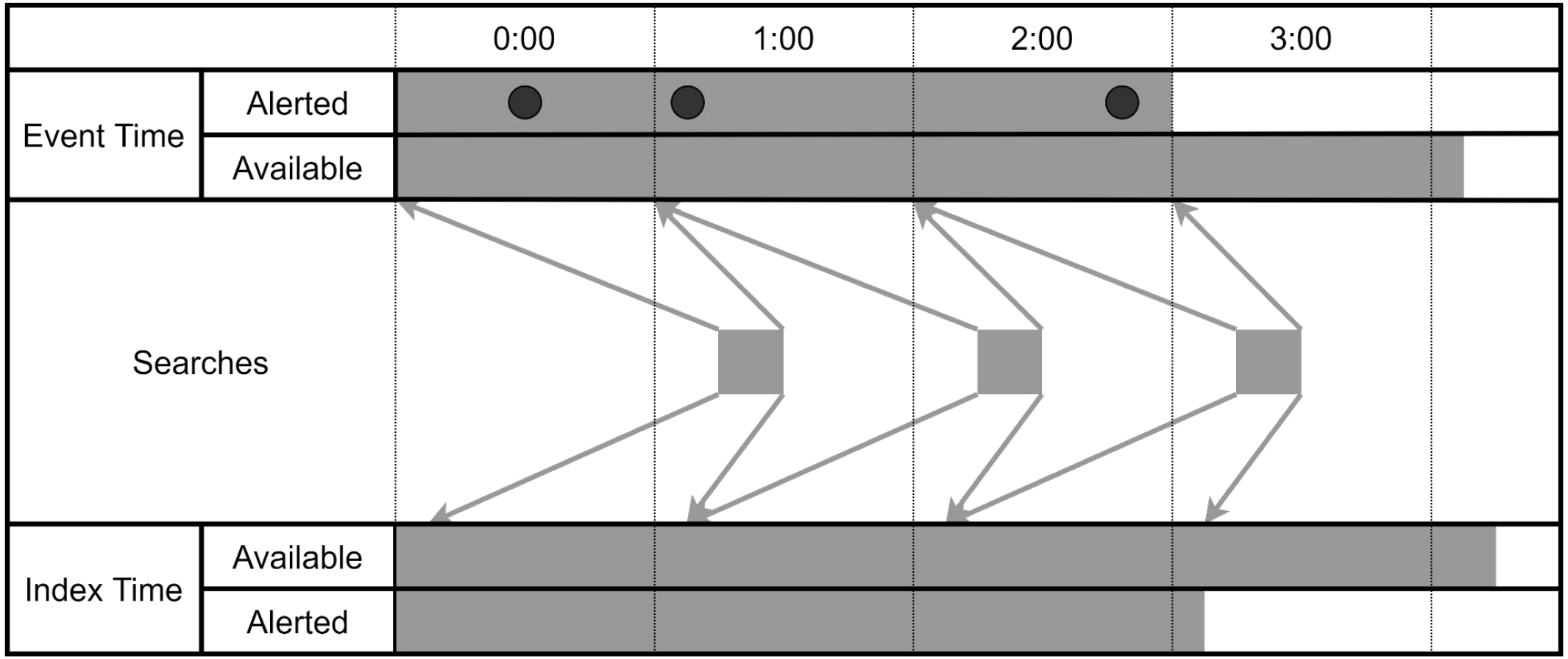
Normal Conditions | Event Time Searching



Time: 03:10

Alerts Raised: 3 of 3

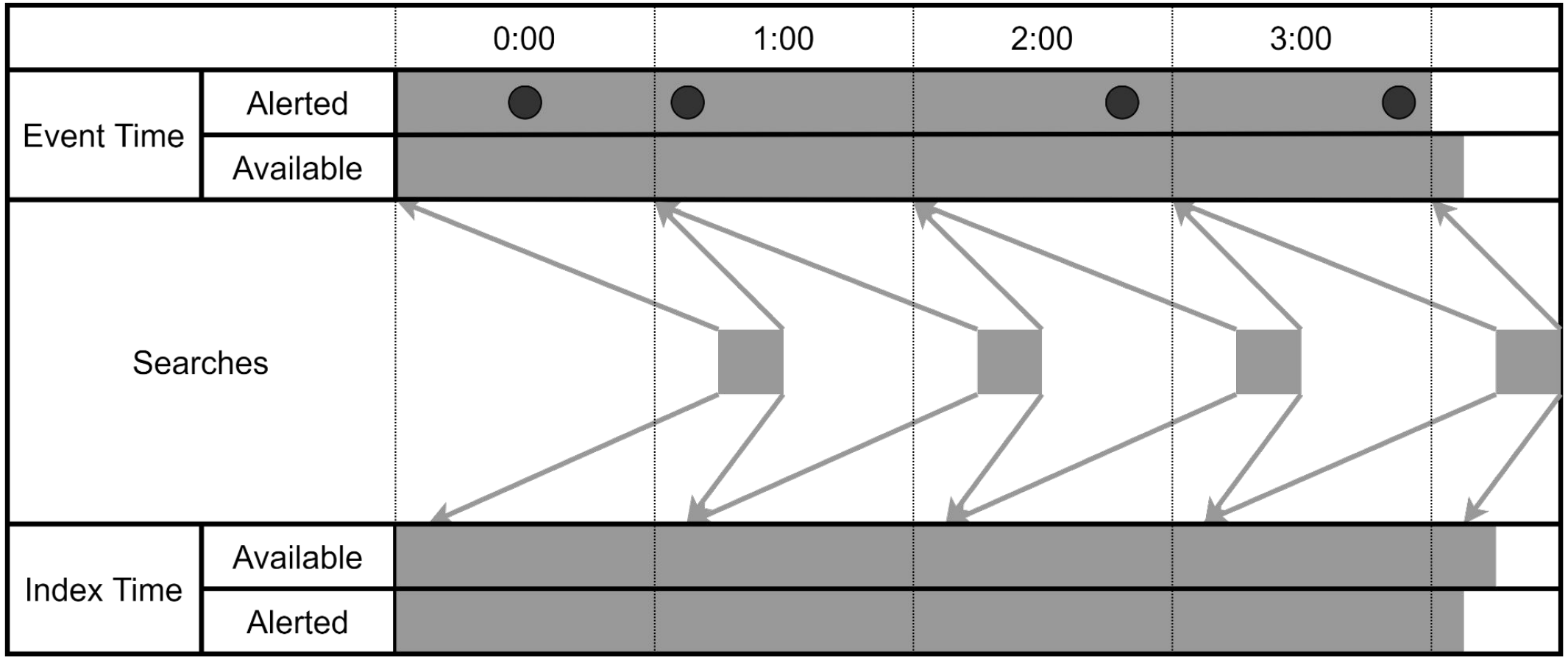
Normal Conditions | Event Time Searching



Time: 04:10

Alerts Raised: 3 of 3

Normal Conditions | Event Time Searching

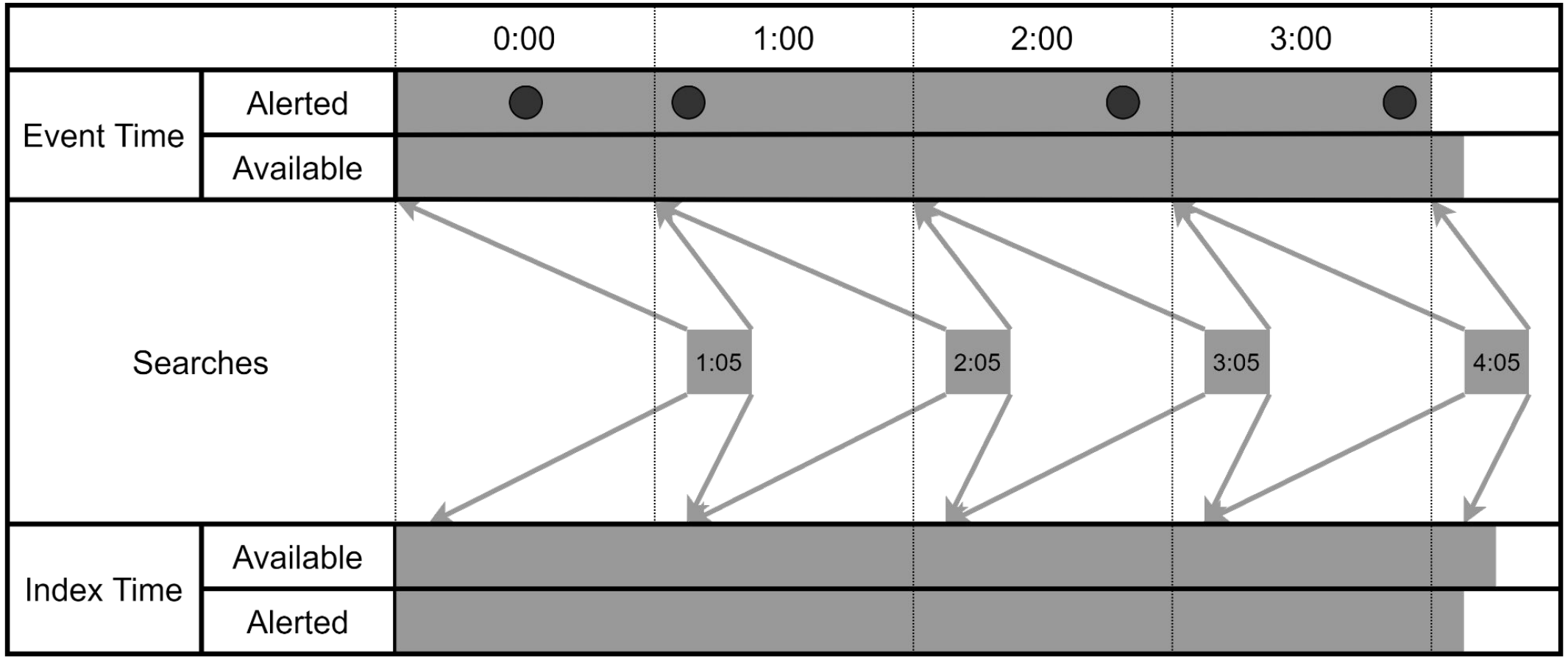


Time: 04:10

Alerts Raised: 4 of 4

Scenario: Normal Conditions
Time Source: Index Time Searching

Normal Conditions | Index Time Searching



Time: 04:05

Alerts Raised: 4 of 4

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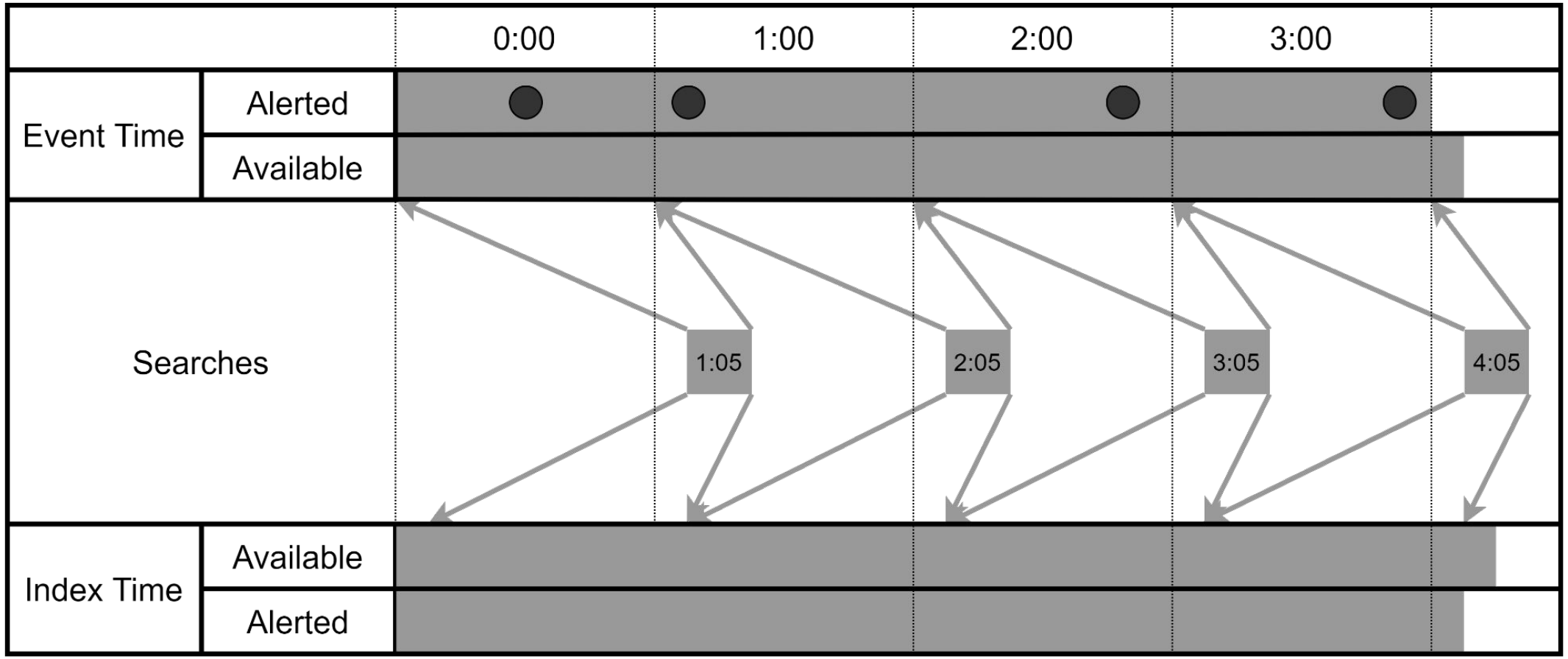
Scenario: Normal Conditions
Time Source: Macro Method Searching

Normal Conditions | Macro Method Searching



Time: 04:05

Alerts Raised: 4 of 4

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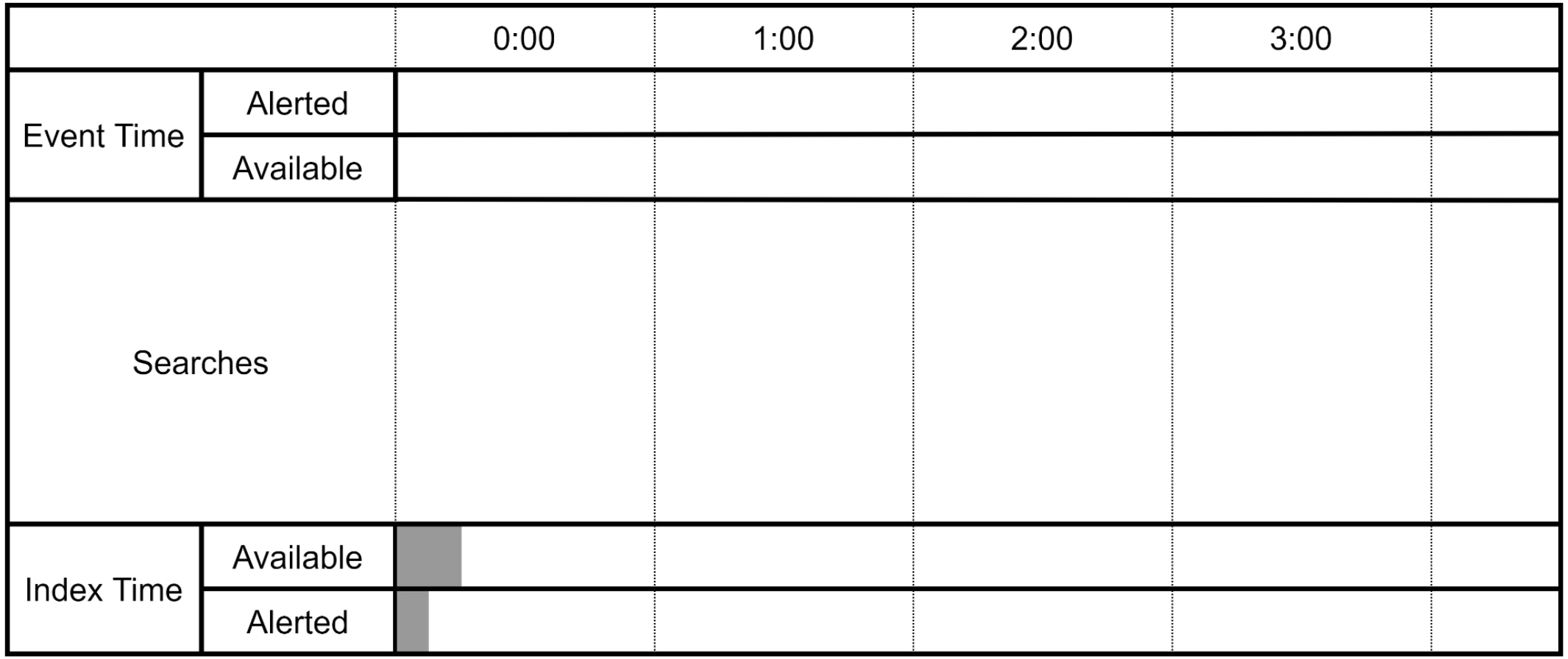
Scenario: Latent Data
Time Source: Event Time Searching

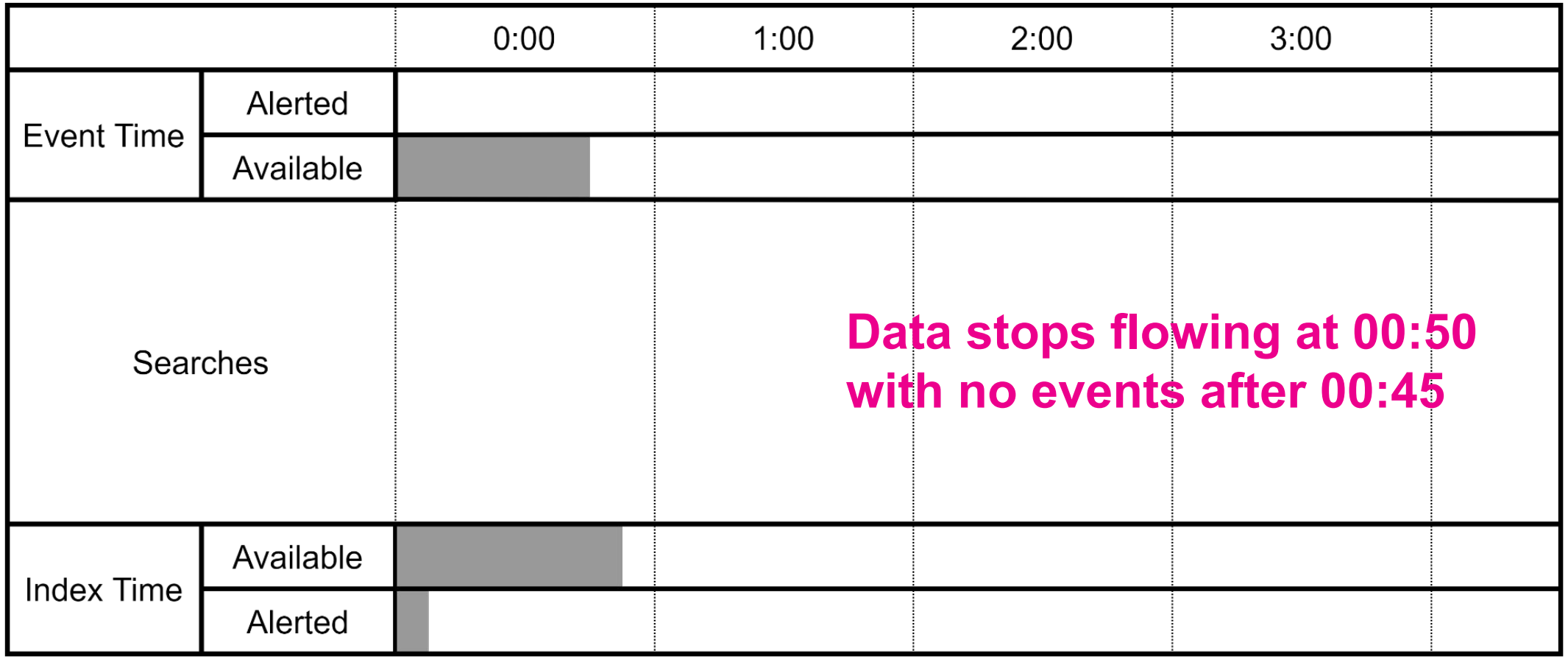
Latent Data | Event Time Searching



Time: 00:10

Alerts Raised: 0 of 0

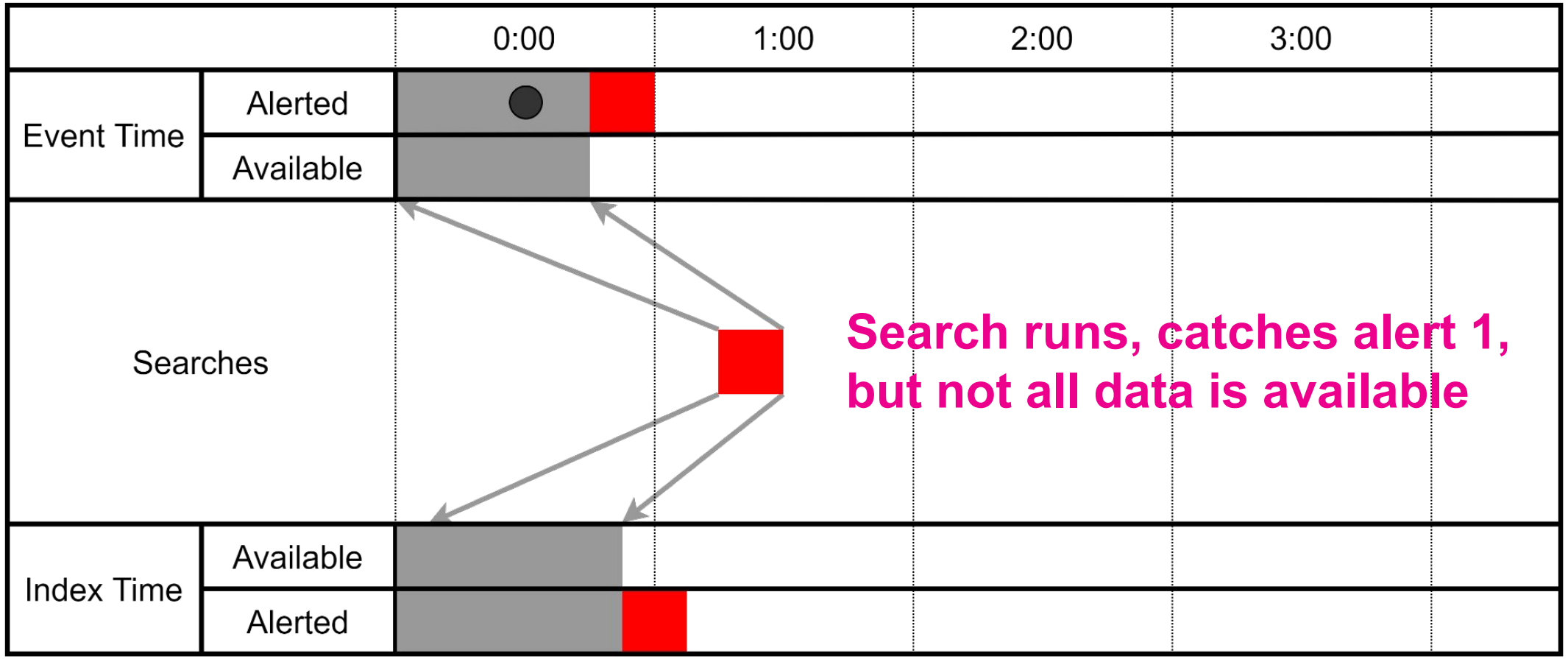
Latent Data | Event Time Searching



Time: 01:10

Alerts Raised: 0 of 0

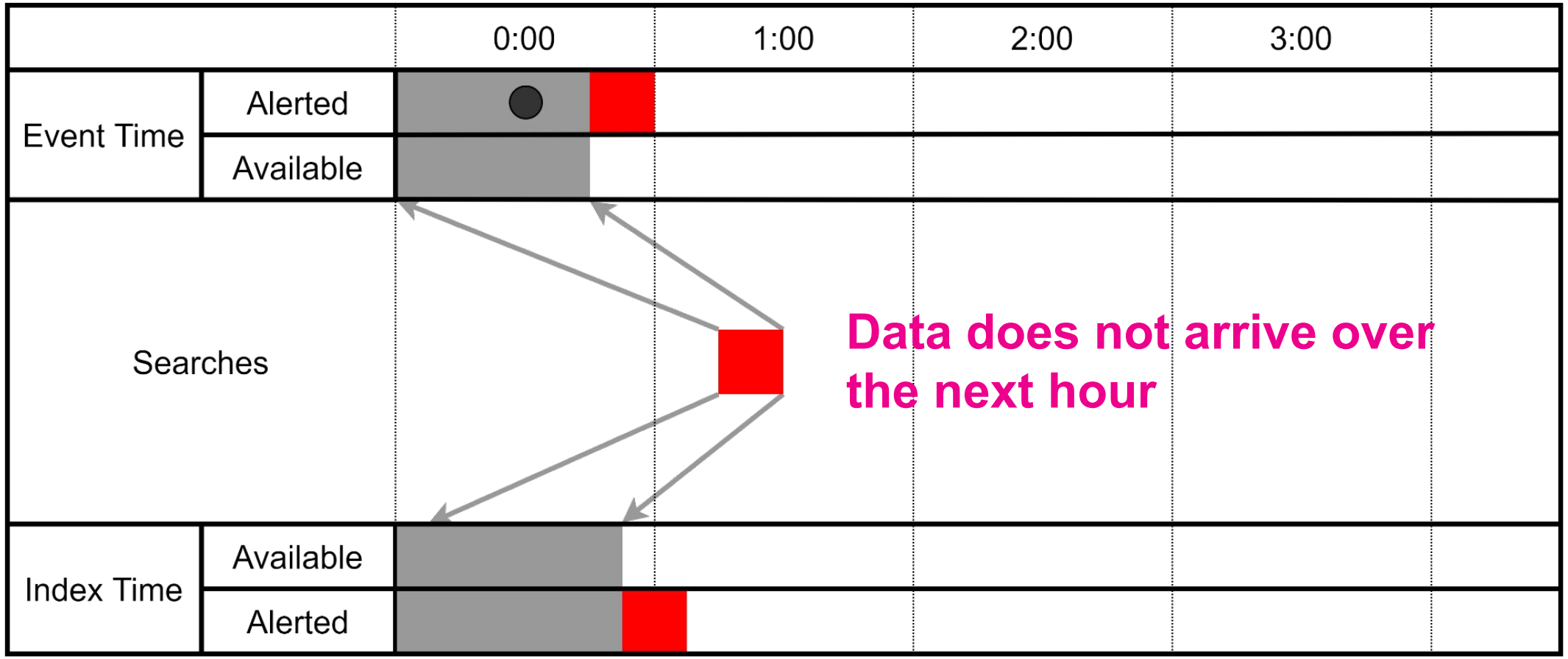
Latent Data | Event Time Searching



Time: 01:10

Alerts Raised: 1 of 1

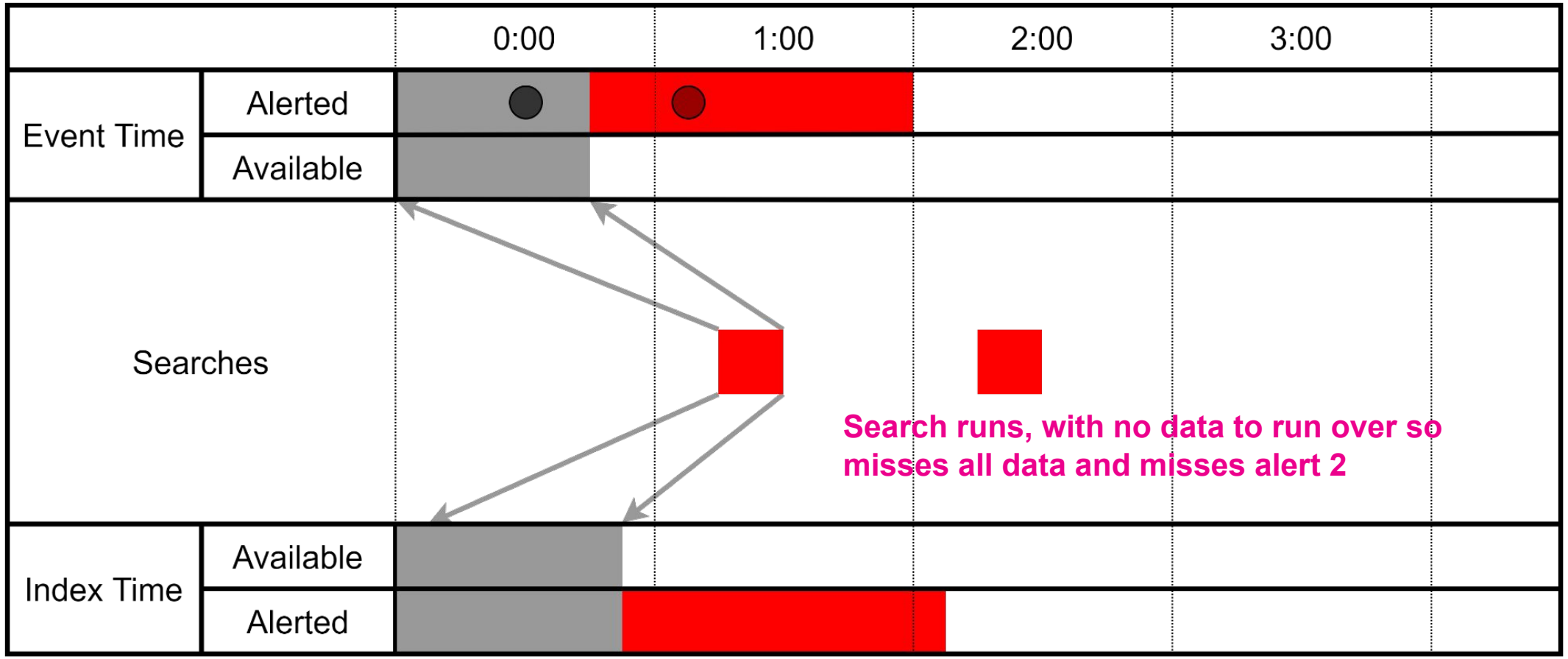
Latent Data | Event Time Searching



Time: 02:10

Alerts Raised: 1 of 1

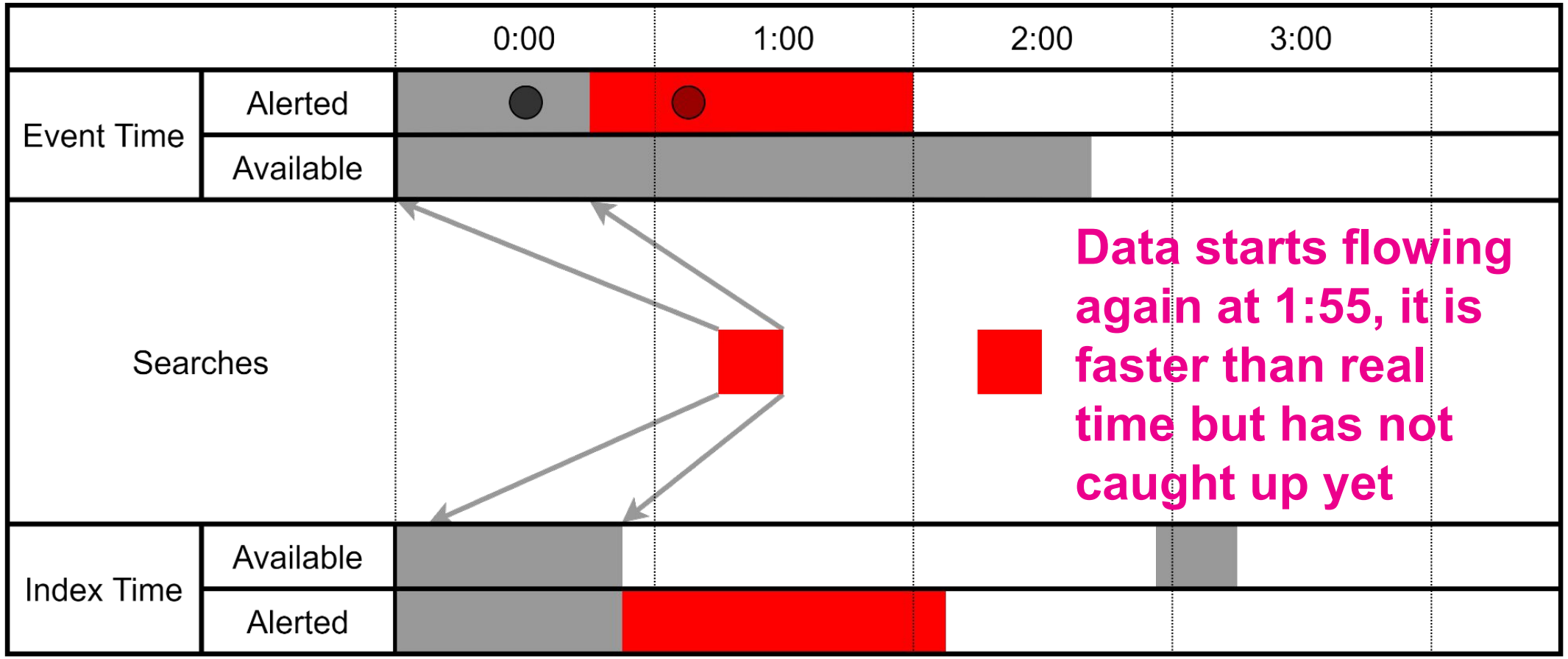
Latent Data | Event Time Searching



Time: 02:10

Alerts Raised: 1 of 2

Latent Data | Event Time Searching



Time: 03:10

Alerts Raised: 1 of 2

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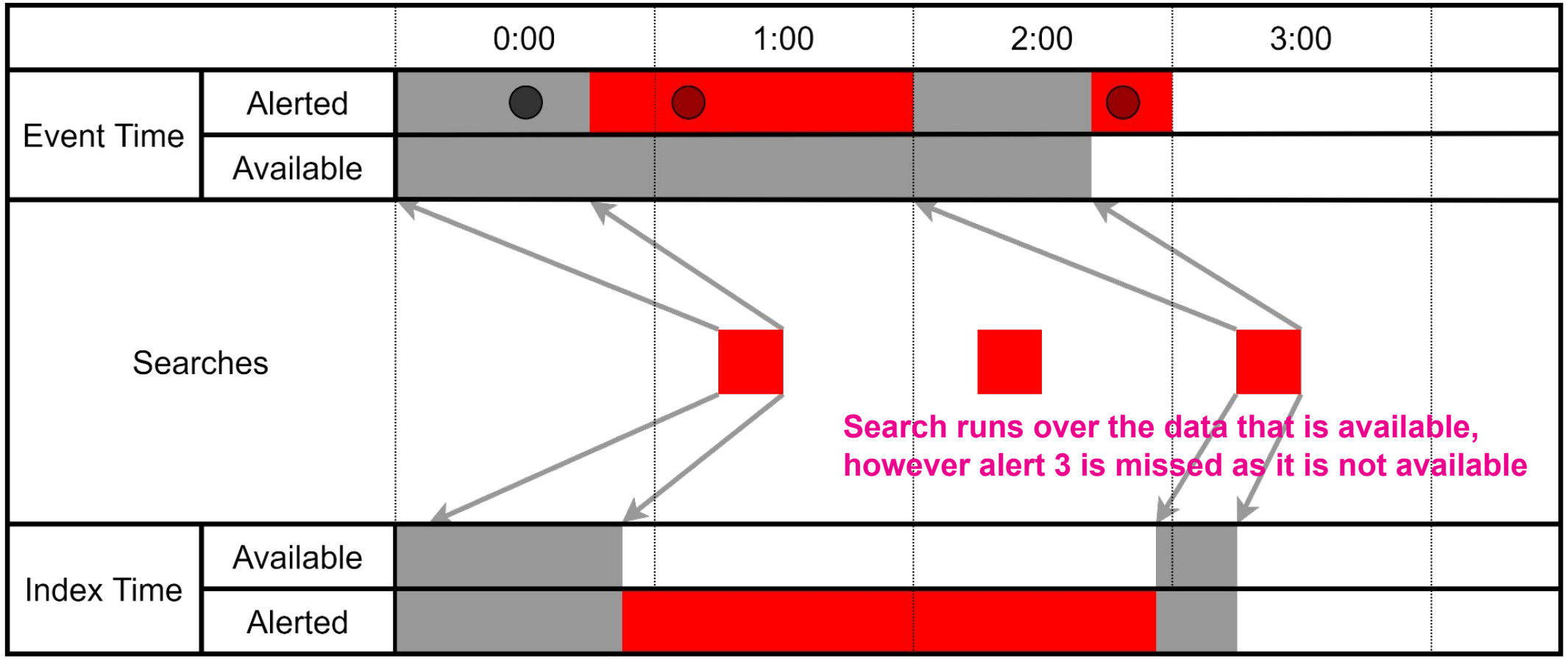
Latent Data | Event Time Searching



Time: 03:10

Alerts Raised: 1 of 3

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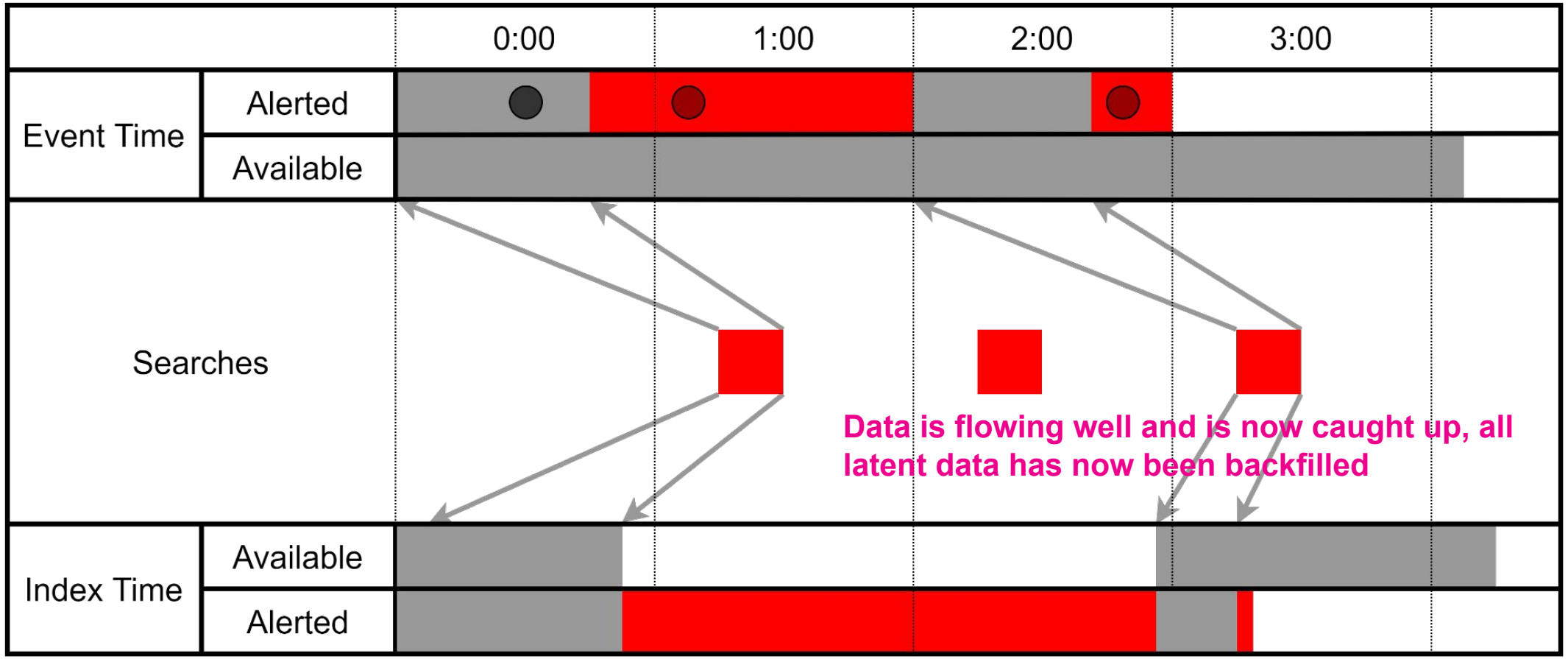
Latent Data | Event Time Searching



Time: 04:10

Alerts Raised: 1 of 3

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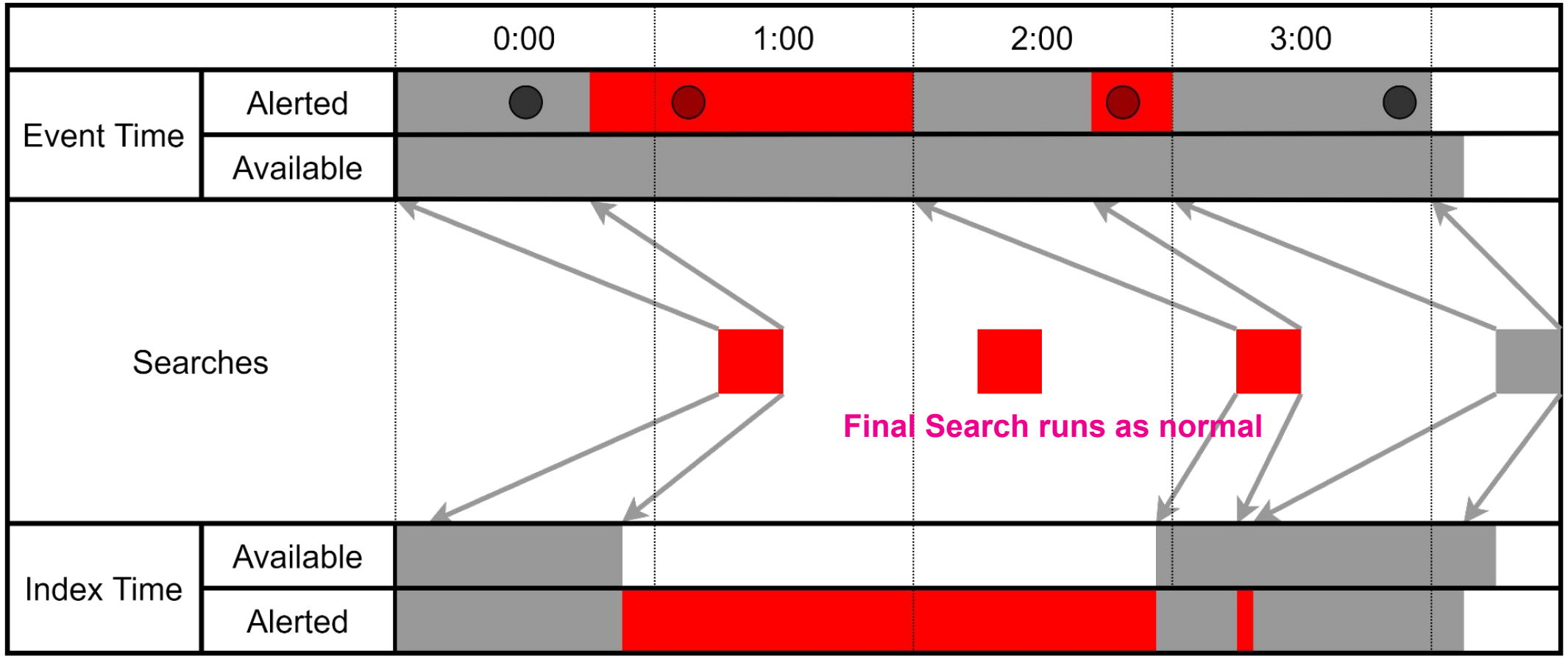
Latent Data | Event Time Searching

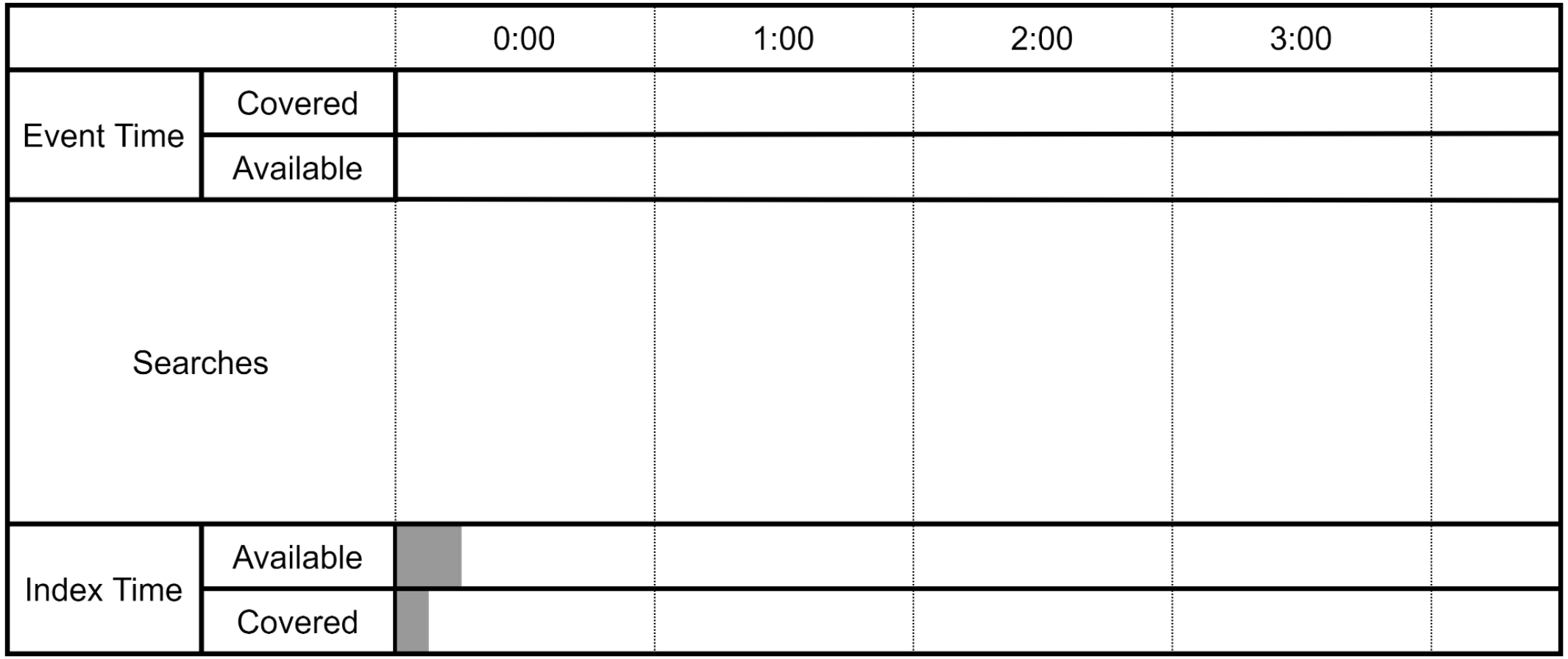


Time: 04:10

Alerts Raised: 2 of 4

Scenario: Latent Data
Time Source: Index Time Searching

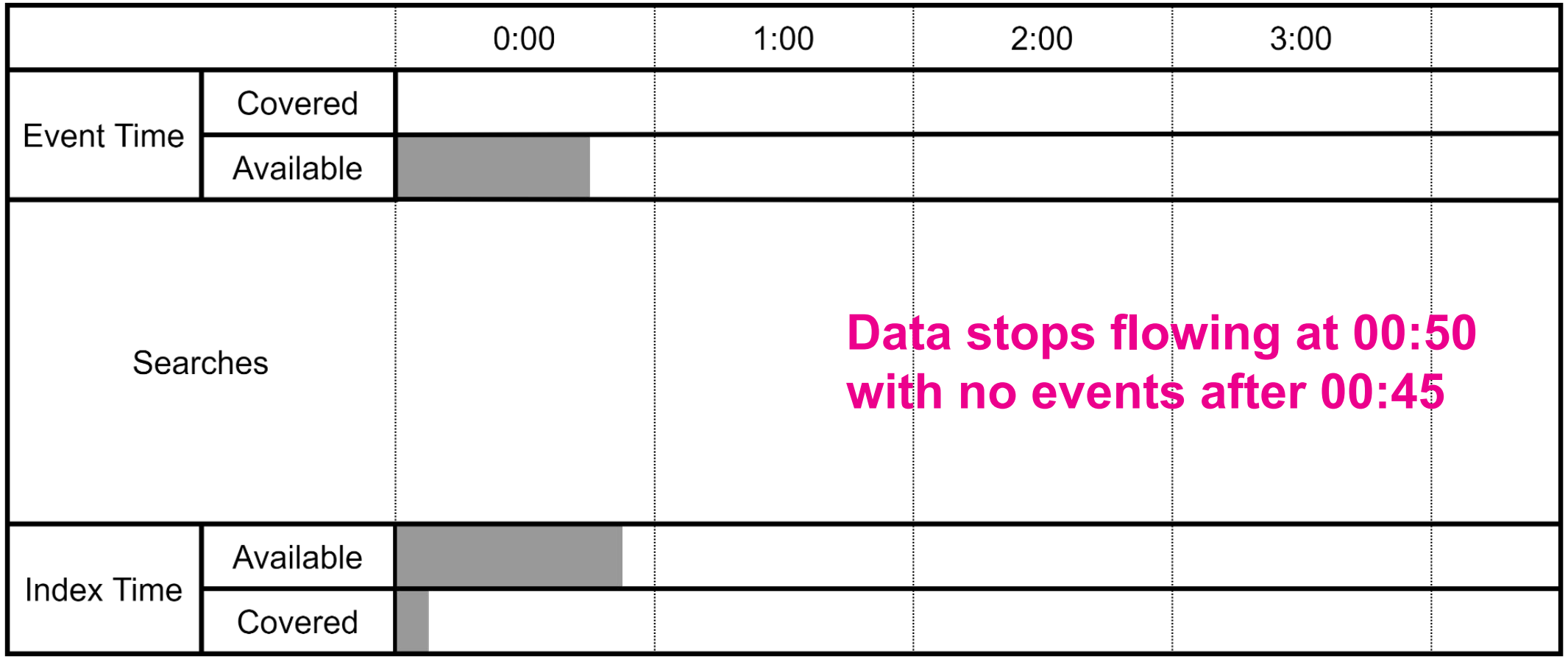
Latent Data | Index Time / Macro Method



Time: 00:10

Alerts Raised: 0 of 0

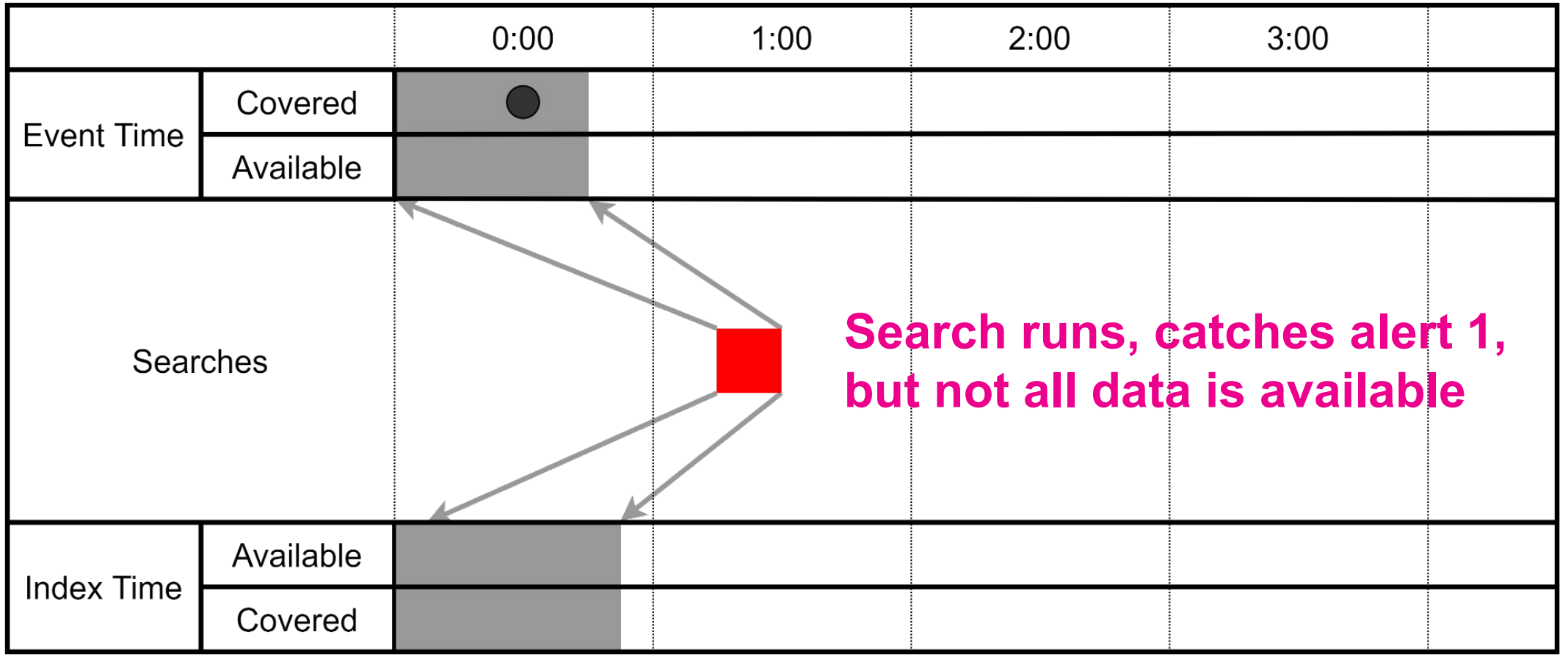
Latent Data | Index Time / Macro Method



Time: 01:10

Alerts Raised: 0 of 0

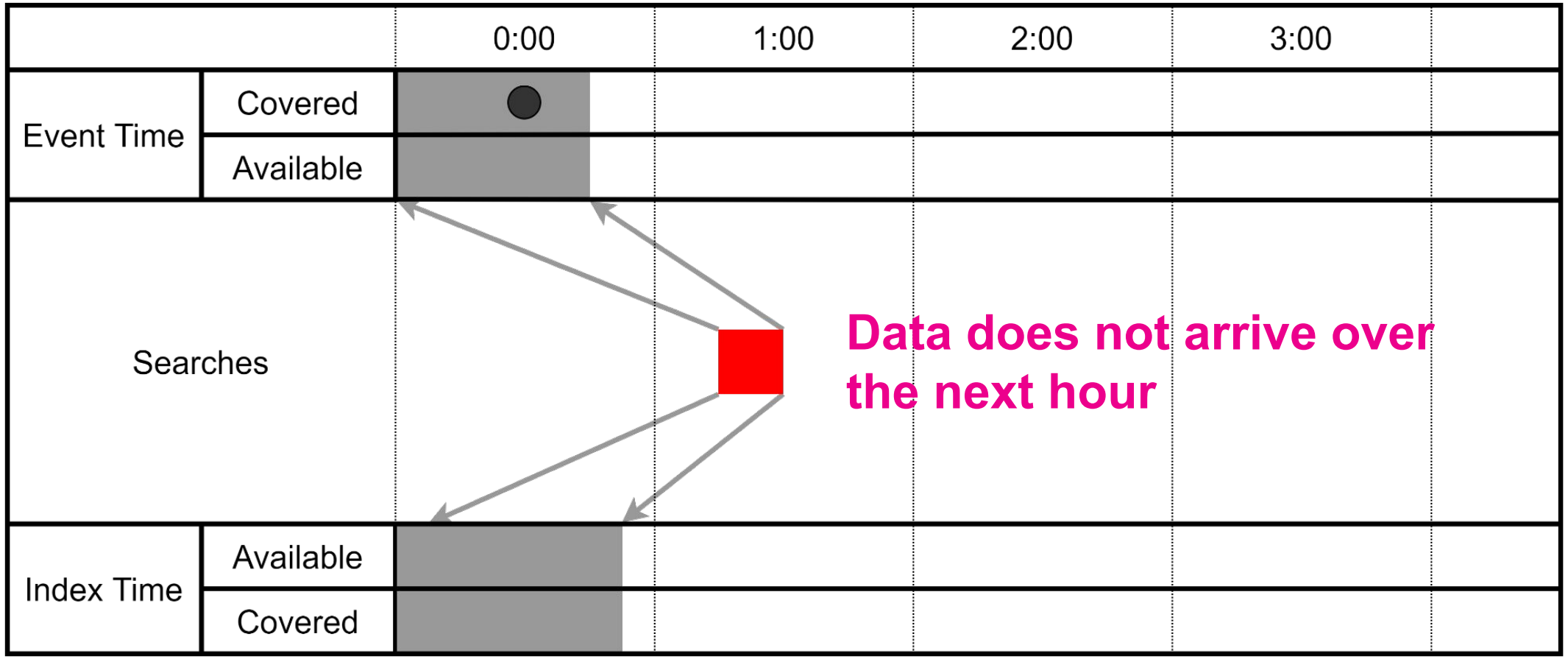
Latent Data | Index Time / Macro Method



Time: 01:10

Alerts Raised: 1 of 1

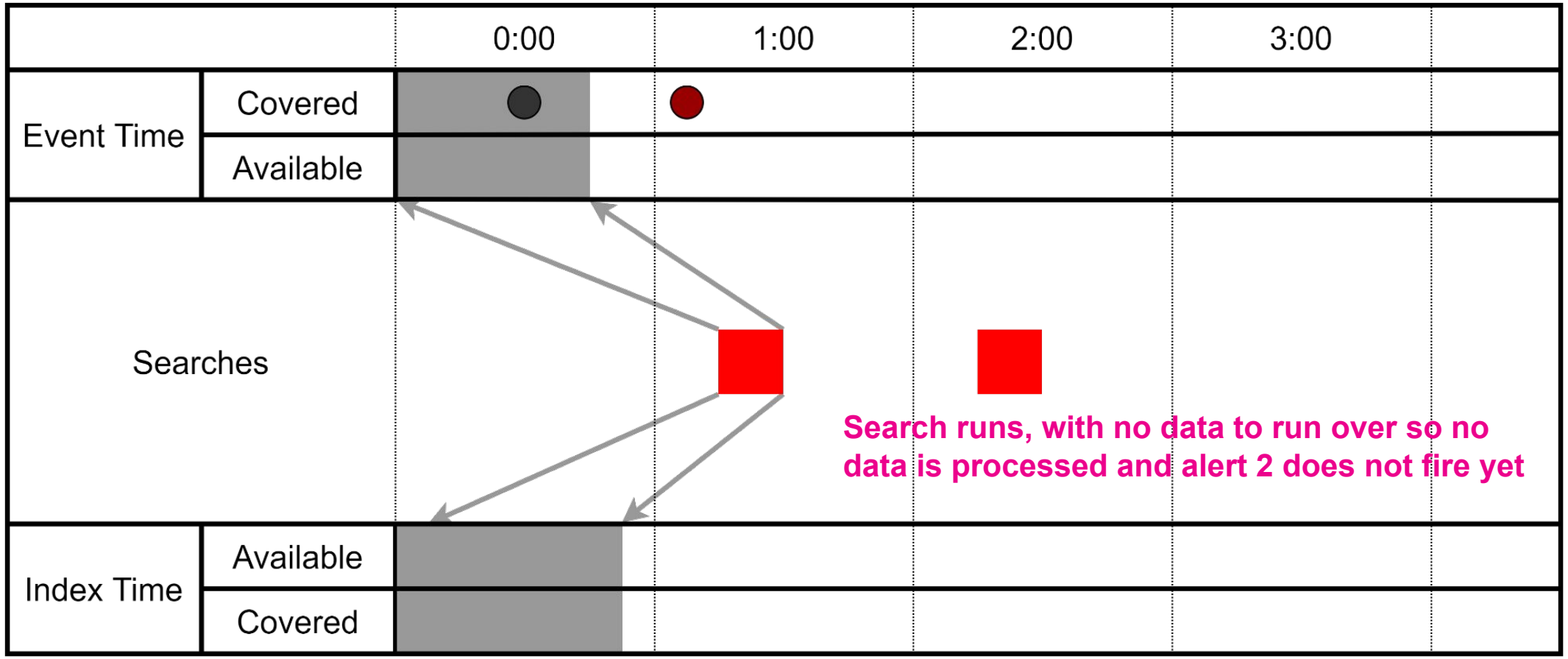
Latent Data | Index Time / Macro Method



Time: 02:10

Alerts Raised: 1 of 1

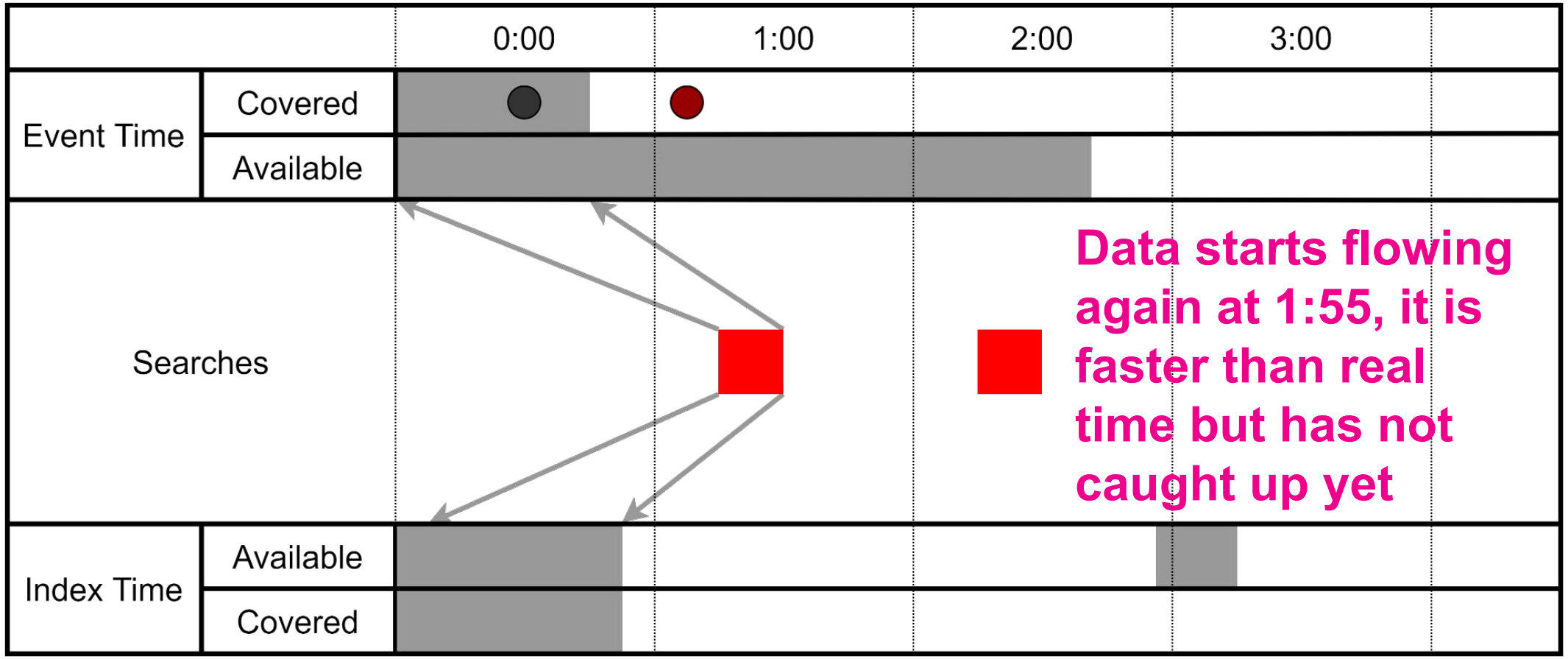
Latent Data | Index Time / Macro Method



Time: 02:10

Alerts Raised: 1 of 2

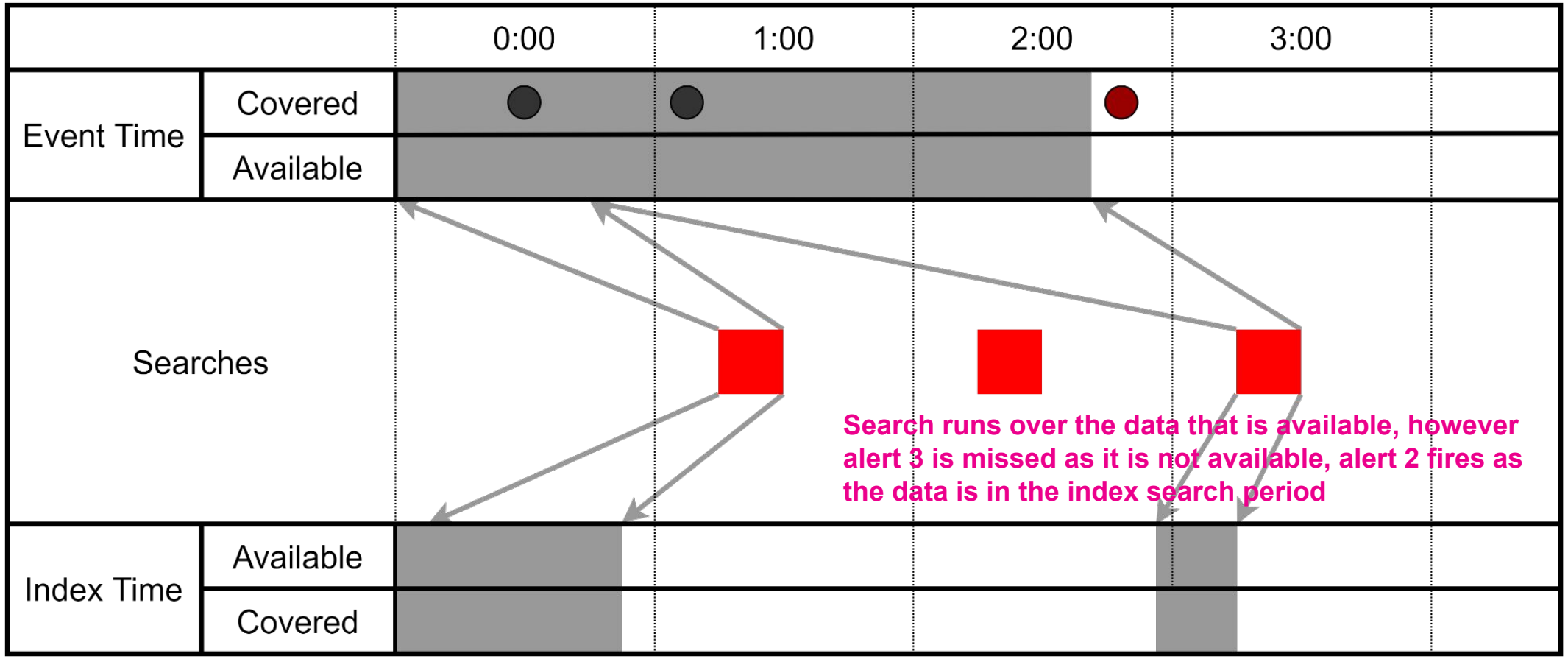
Latent Data | Index Time / Macro Method



Time: 03:10

Alerts Raised: 1 of 2

Latent Data | Index Time / Macro Method



Time: 03:10

Alerts Raised: 2 of 3

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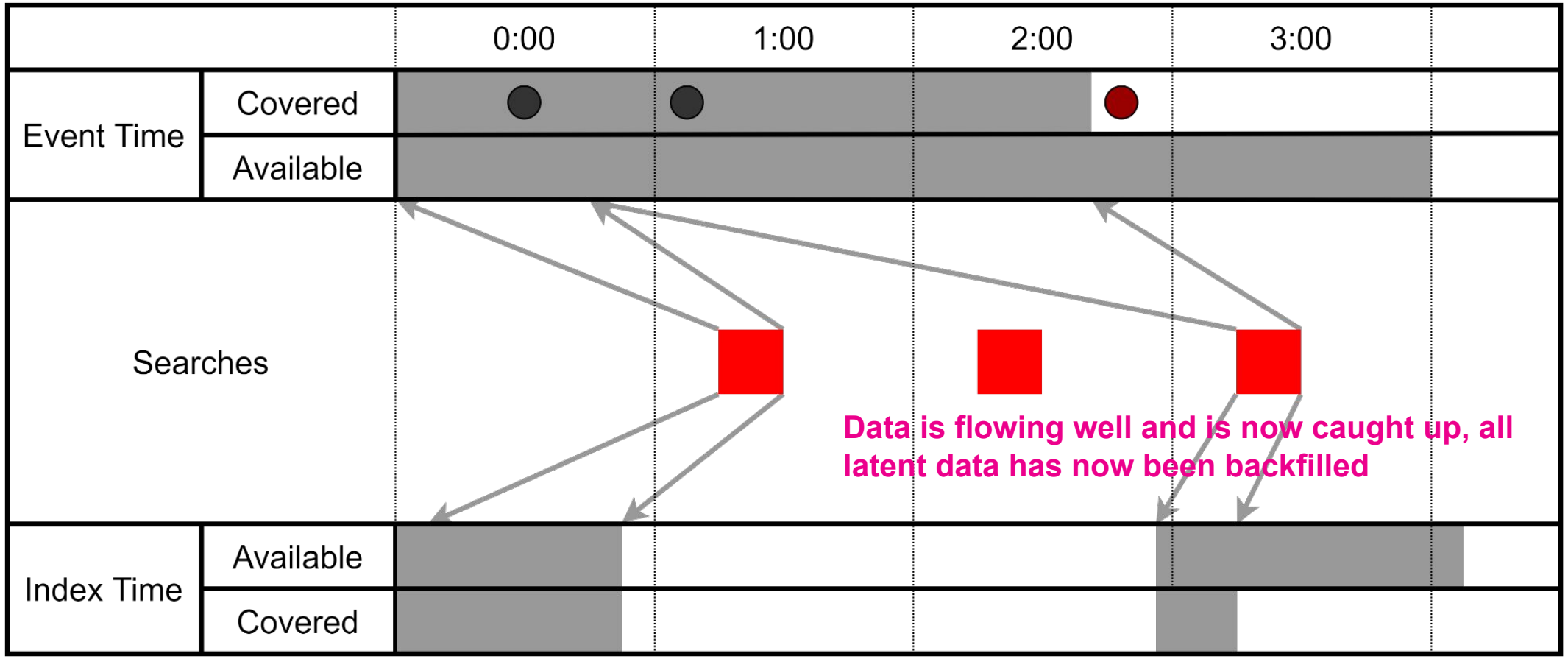
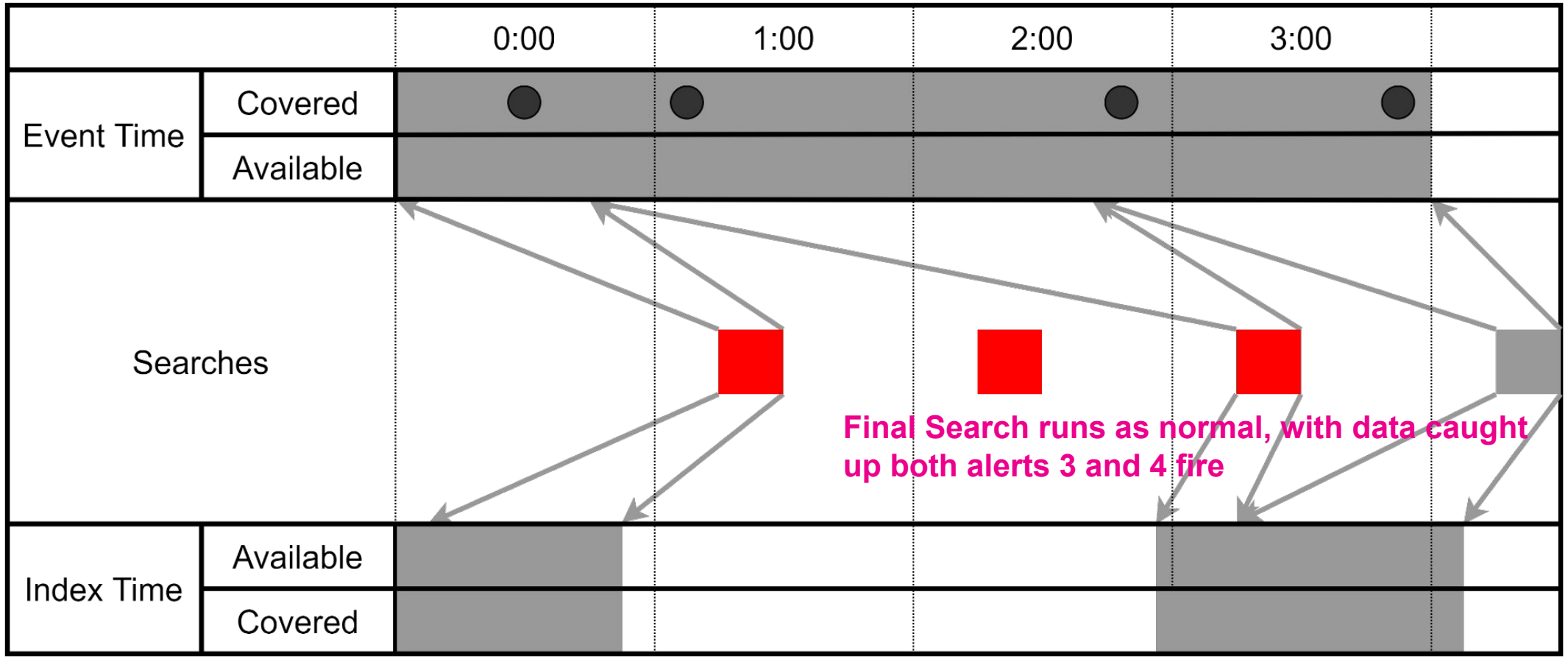
Latent Data | Index Time / Macro Method



Time: 04:10

Alerts Raised: 2 of 3

Latent Data | Index Time / Macro Method



Time: 04:10

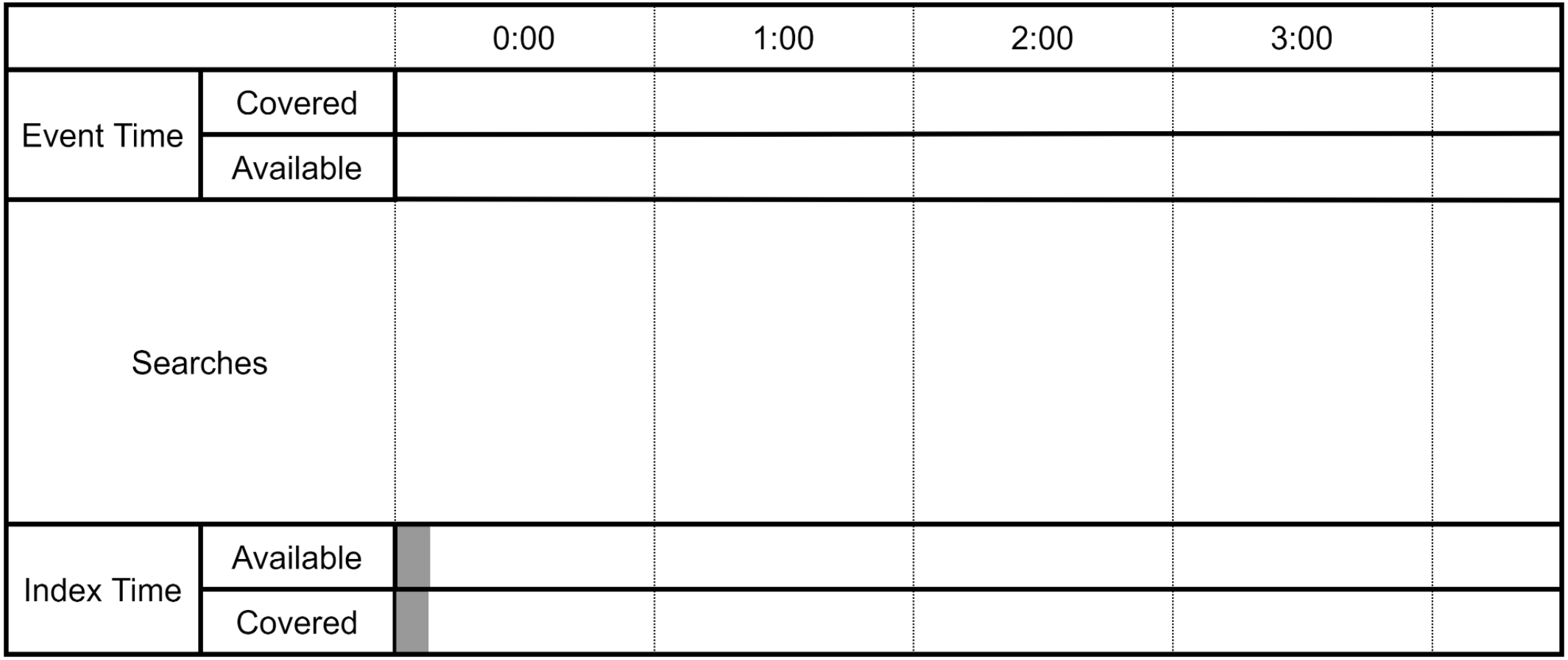
Alerts Raised: 4 of 4

splunk> .conf21

Scenario: Skipped Searches / SH Issues

Time Source: Index Time Searching

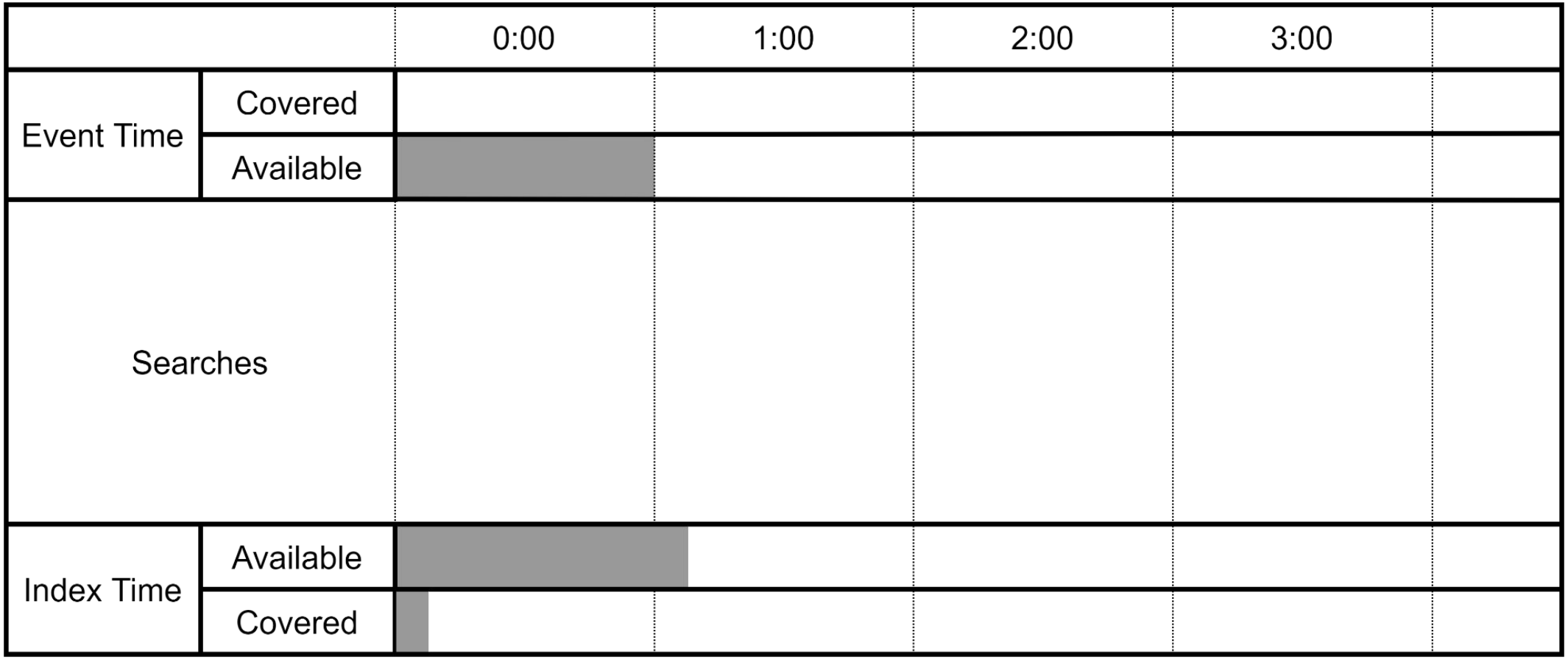
Skipped Search / SH Down / Issues | Index Time



Time: 00:10

Alerts Raised: 0 of 0

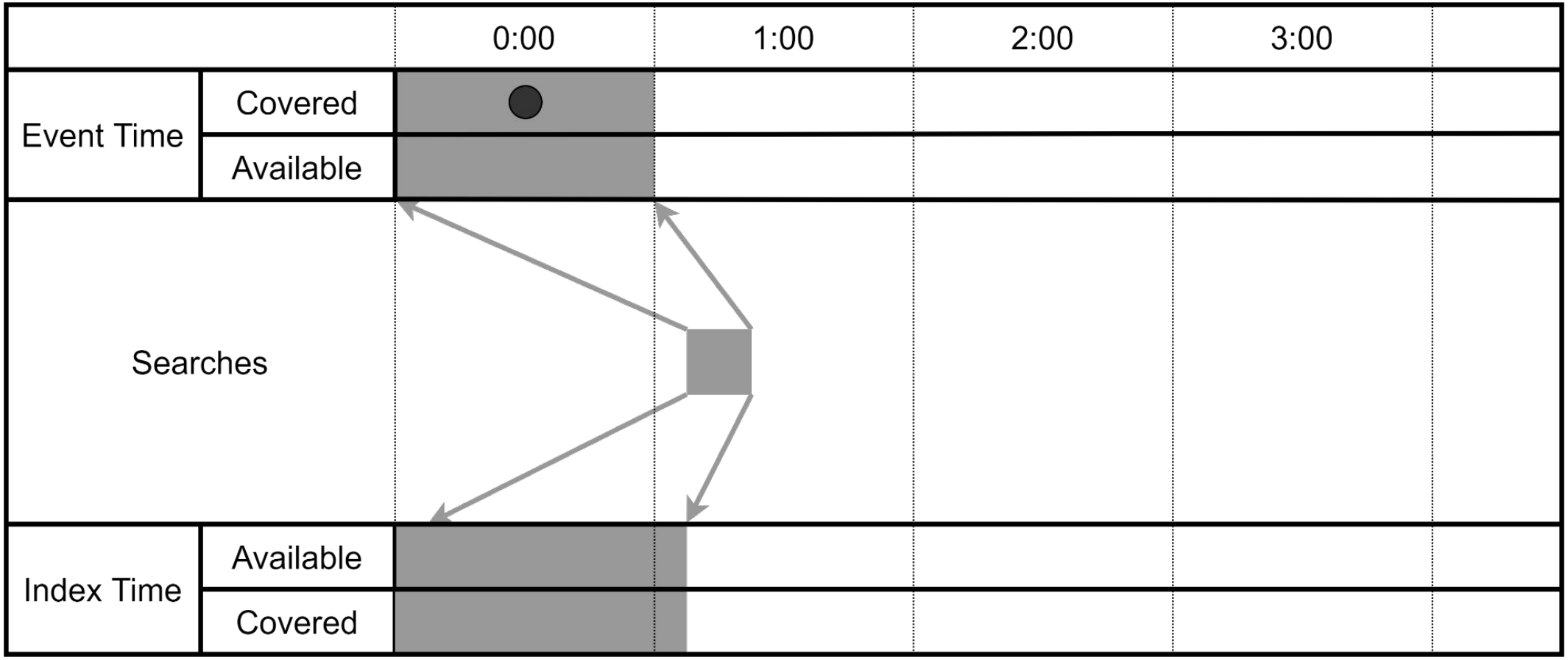
Skipped Search / SH Down / Issues | Index Time



Time: 01:10

Alerts Raised: 0 of 0

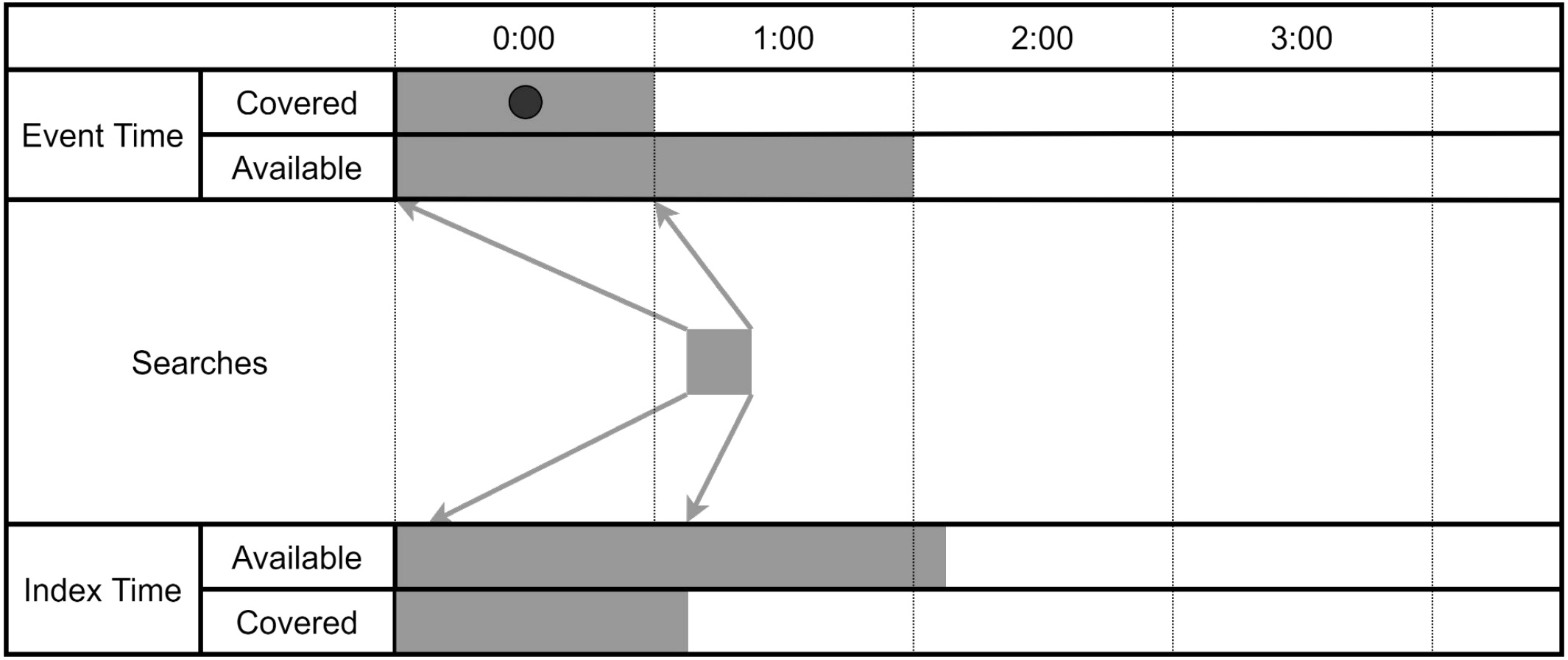
Skipped Search / SH Down / Issues | Index Time



Time: 01:10

Alerts Raised: 1 of 1

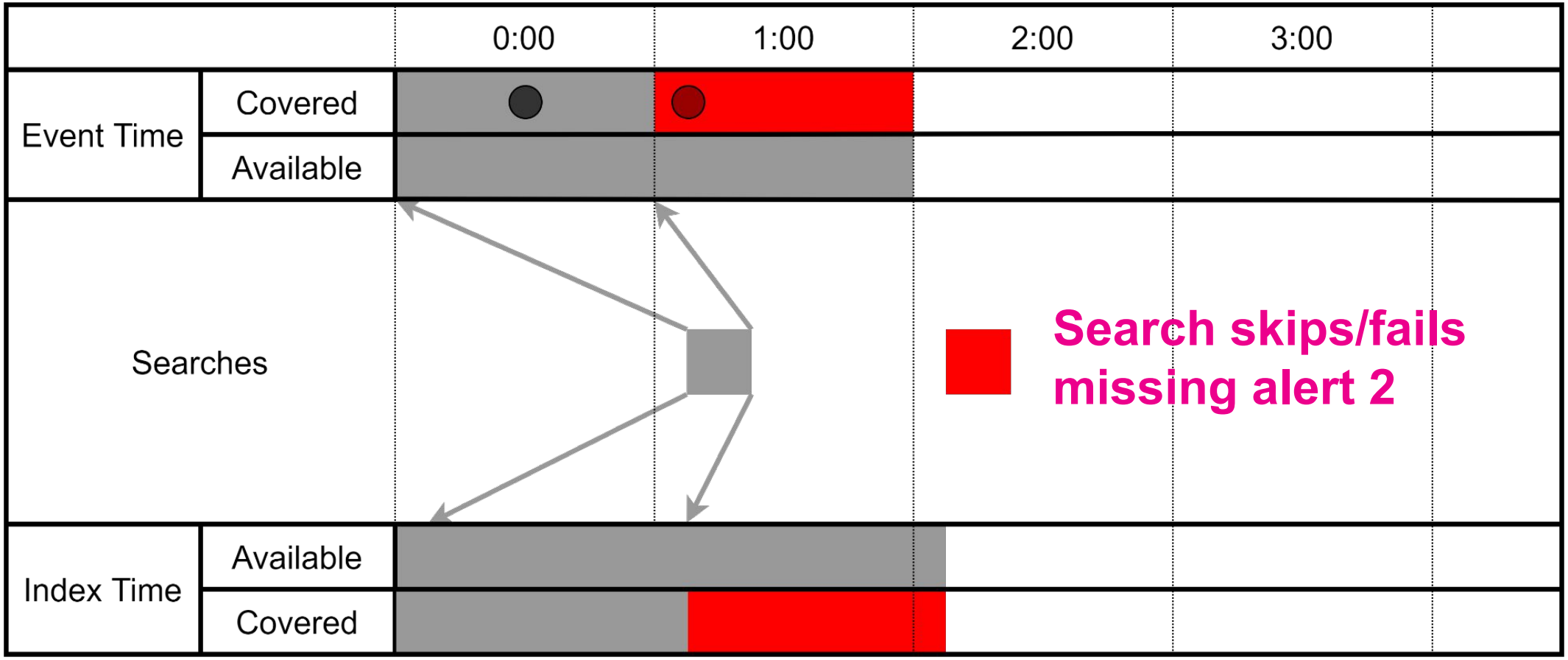
Skipped Search / SH Down / Issues | Index Time



Time: 02:10

Alerts Raised: 1 of 1

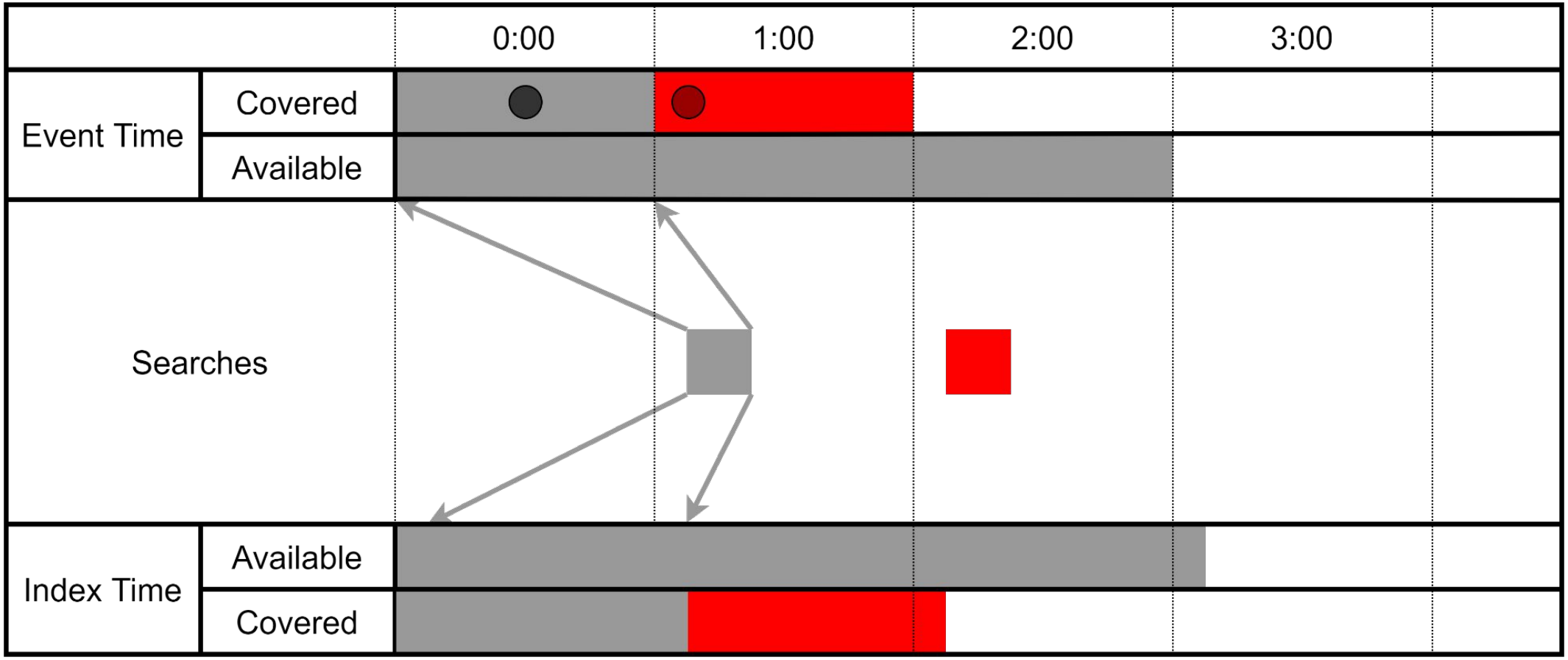
Skipped Search / SH Down / Issues | Index Time



Time: 02:10

Alerts Raised: 1 of 2

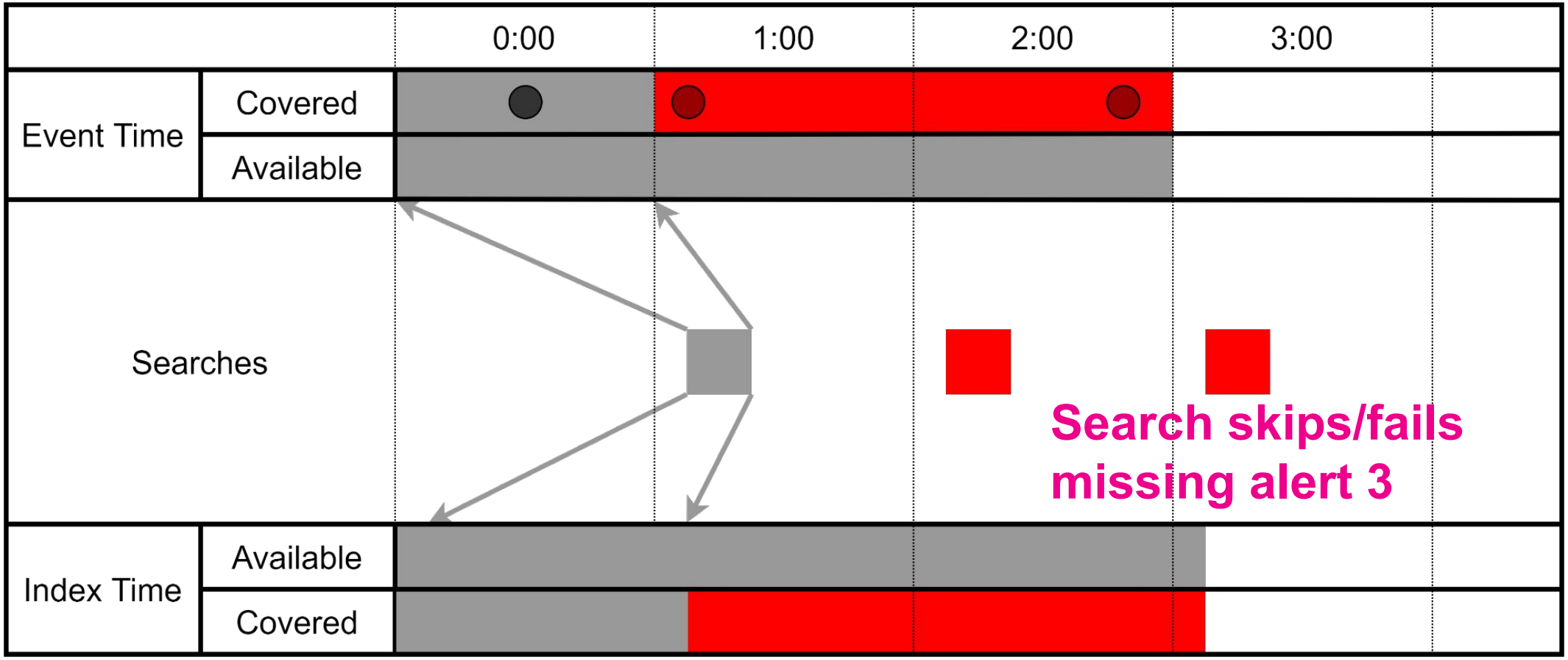
Skipped Search / SH Down / Issues | Index Time



Time: 03:10

Alerts Raised: 1 of 2

Skipped Search / SH Down / Issues | Index Time

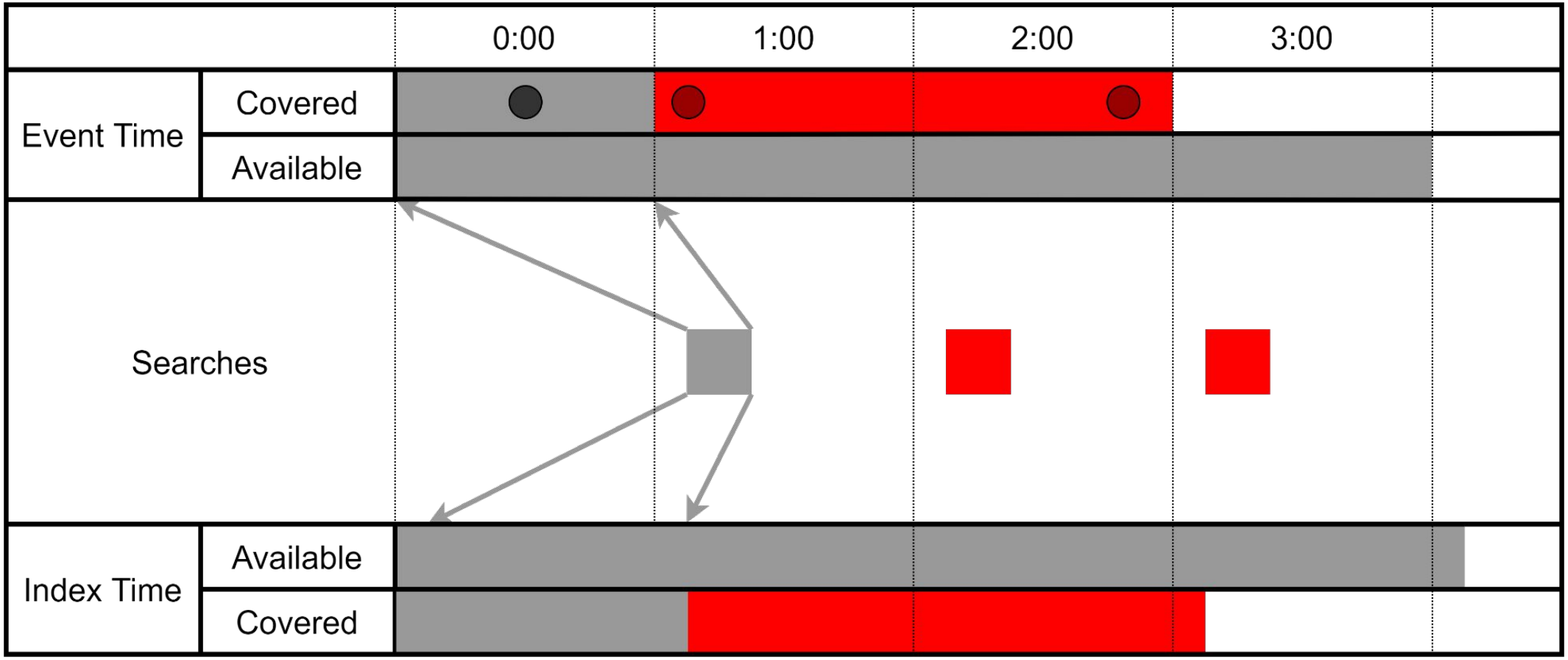


Time: 03:10

Alerts Raised: 1 of 3

splunk> .conf21

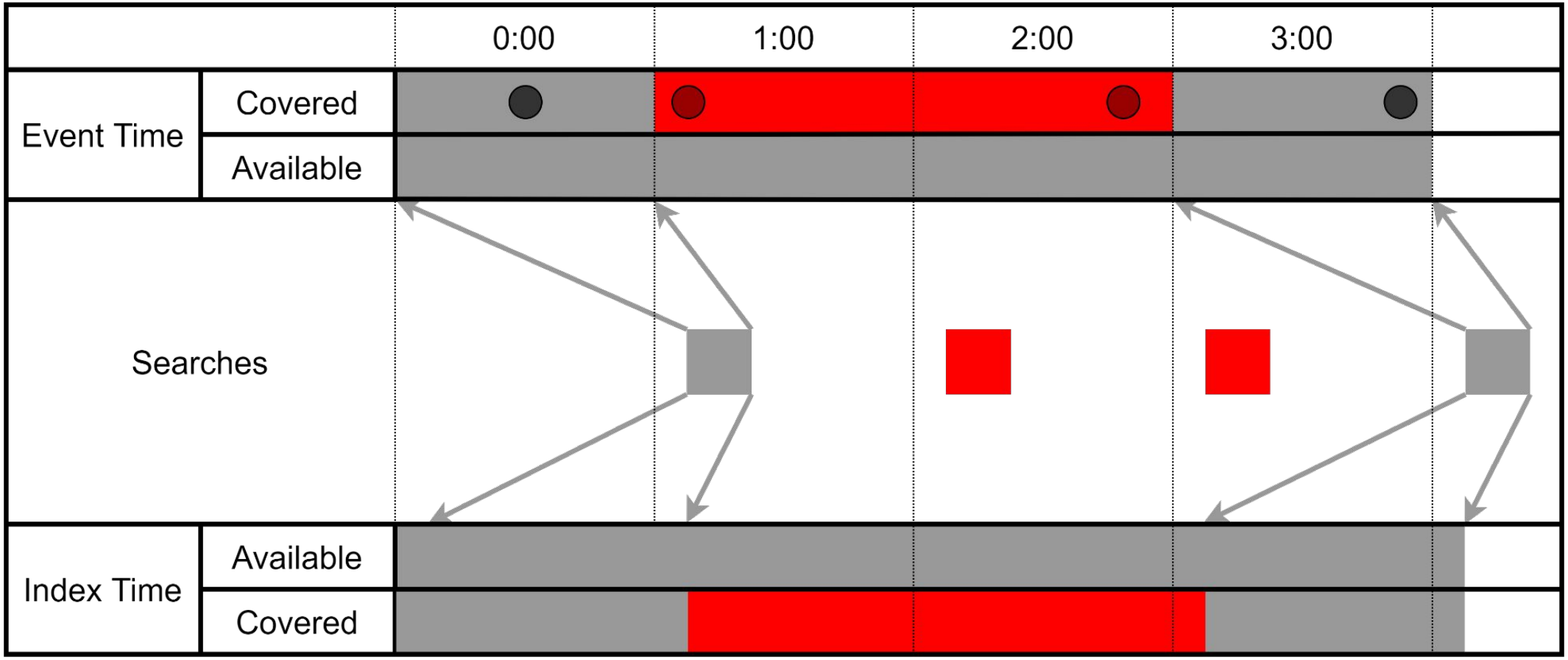
Skipped Search / SH Down / Issues | Index Time



Time: 04:10

Alerts Raised: 1 of 3

Skipped Search / SH Down / Issues | Index Time



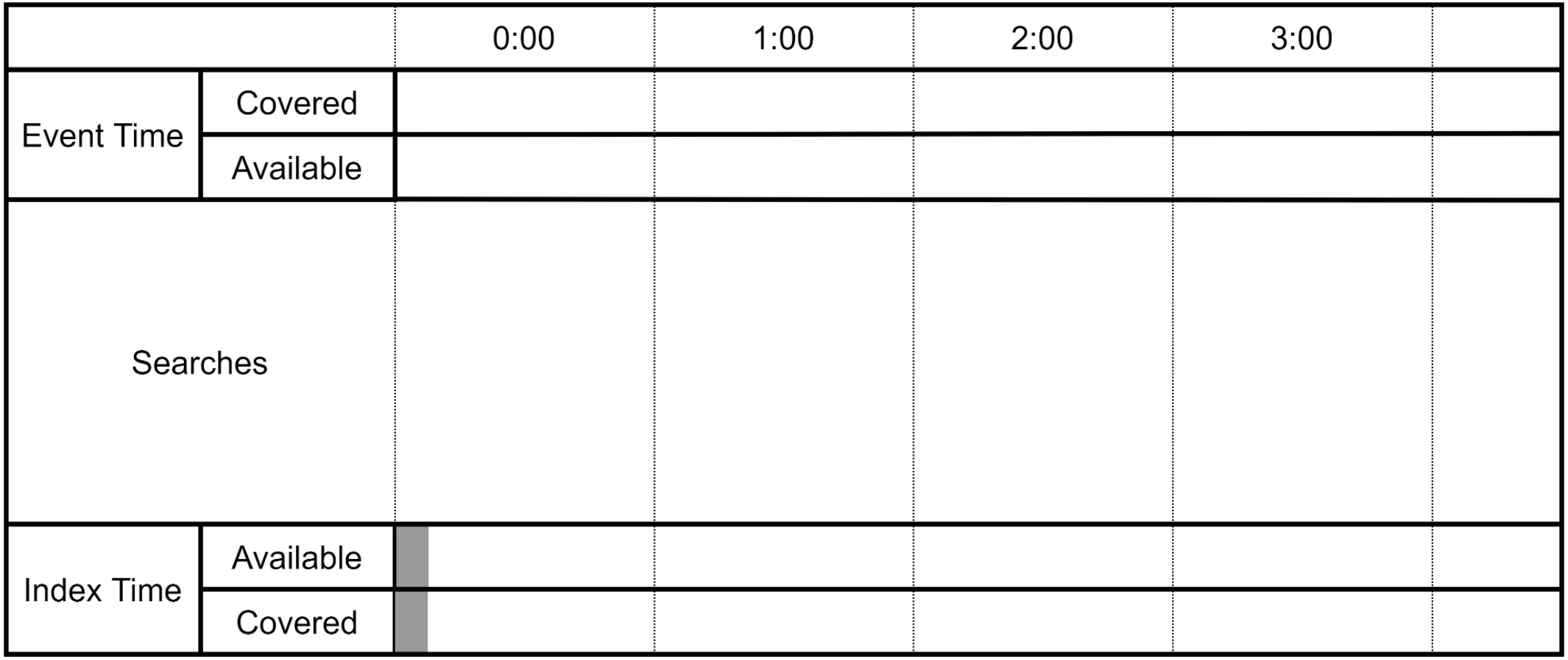
Time: 04:10

Alerts Raised: 2 of 4

Scenario: Skipped Searches / SH Issues

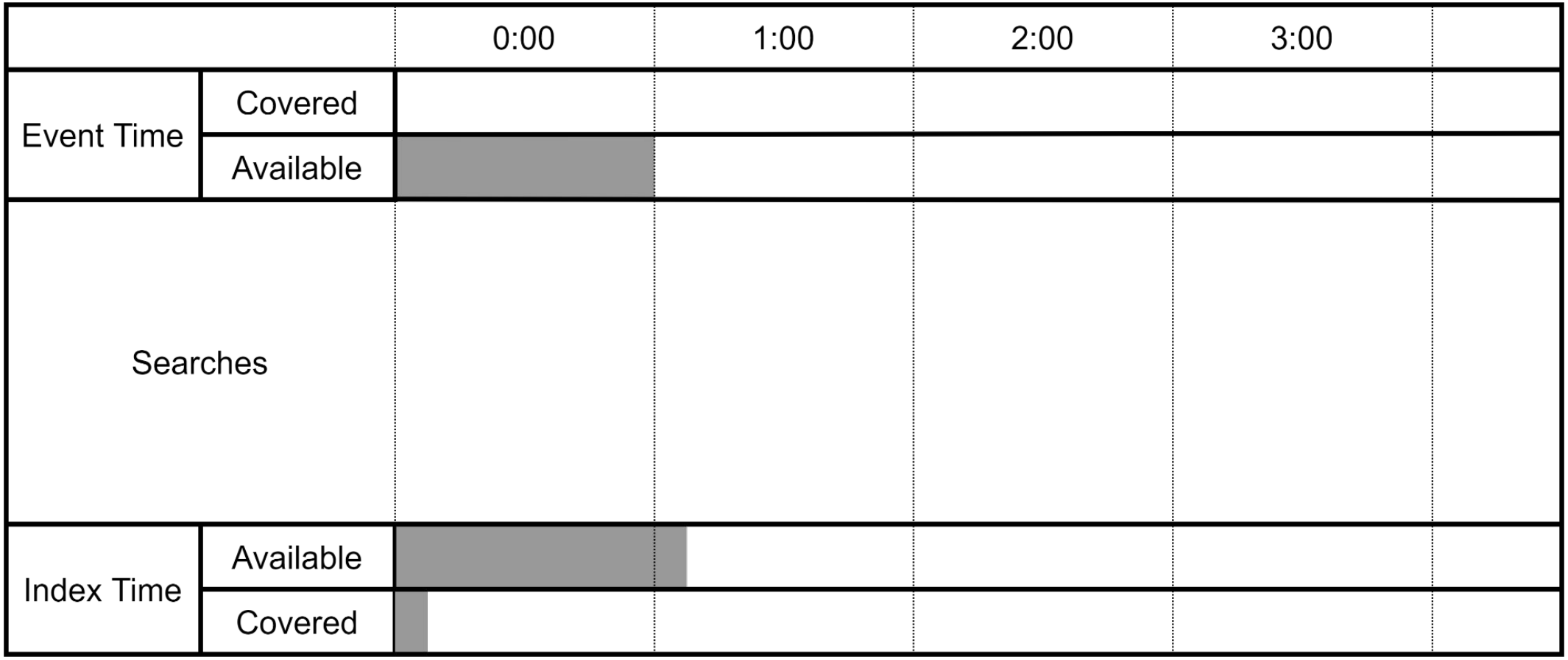
Time Source: Macro Method Searching

Skipped Search / SH Down / Issues | Macro Method



Time: 00:10 **Last Run: 00:10** **Alerts Raised: 0 of 0**

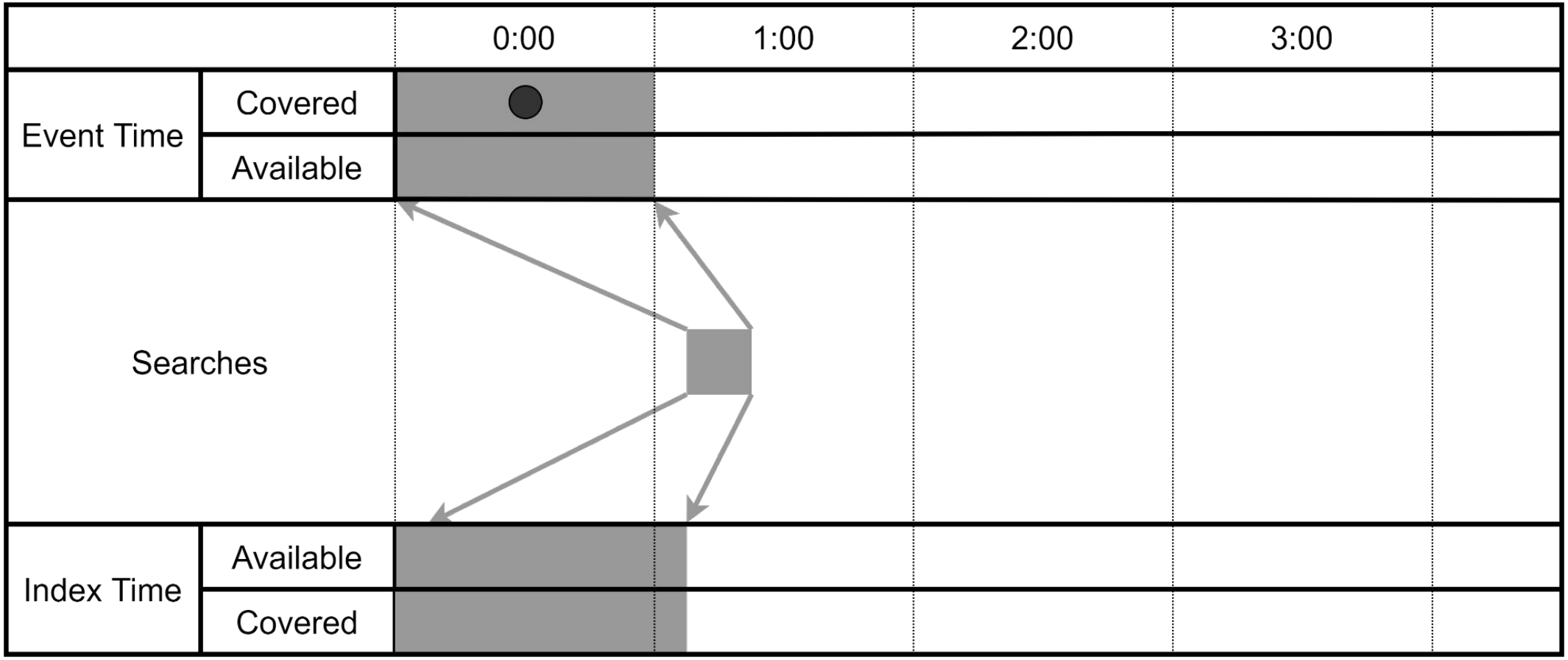
Skipped Search / SH Down / Issues | Macro Method



Time: 01:10 **Last Run: 00:10** **Alerts Raised: 0 of 0**

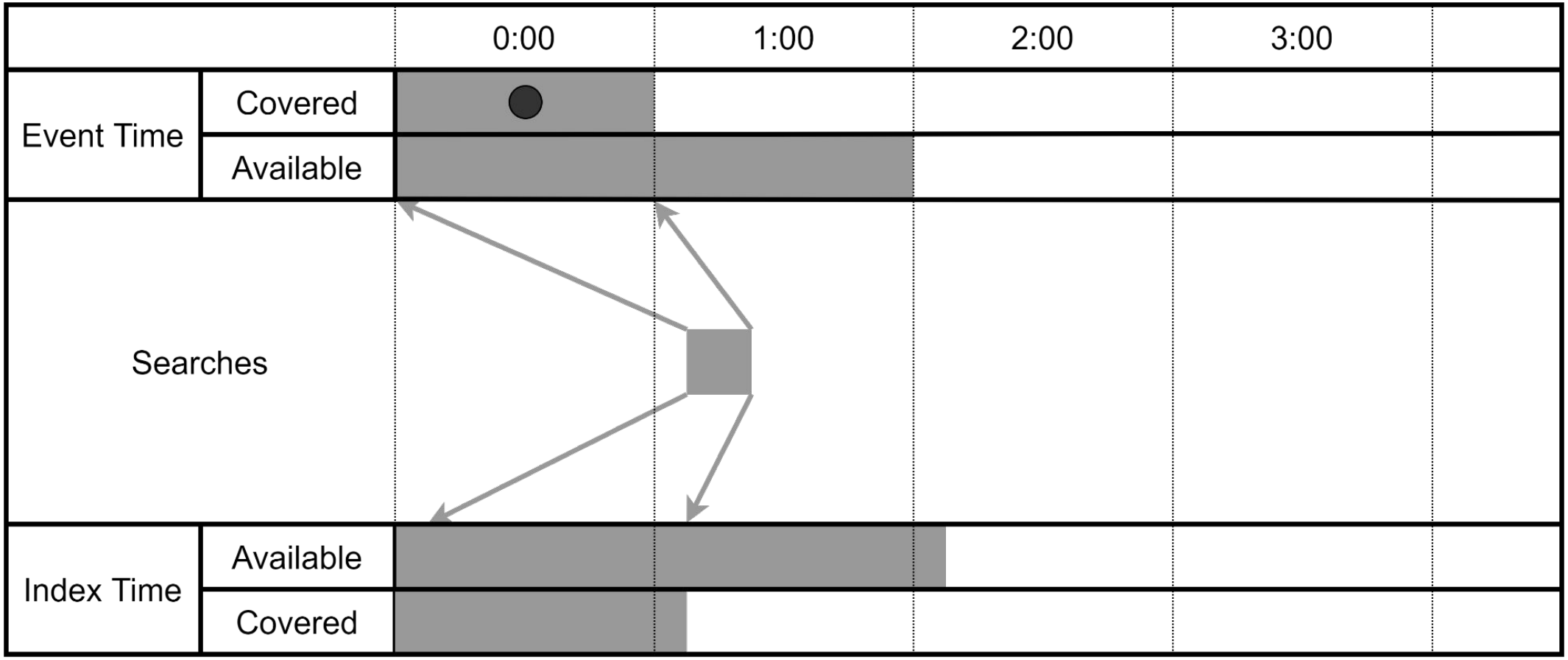
splunk> .conf21

Skipped Search / SH Down / Issues | Macro Method



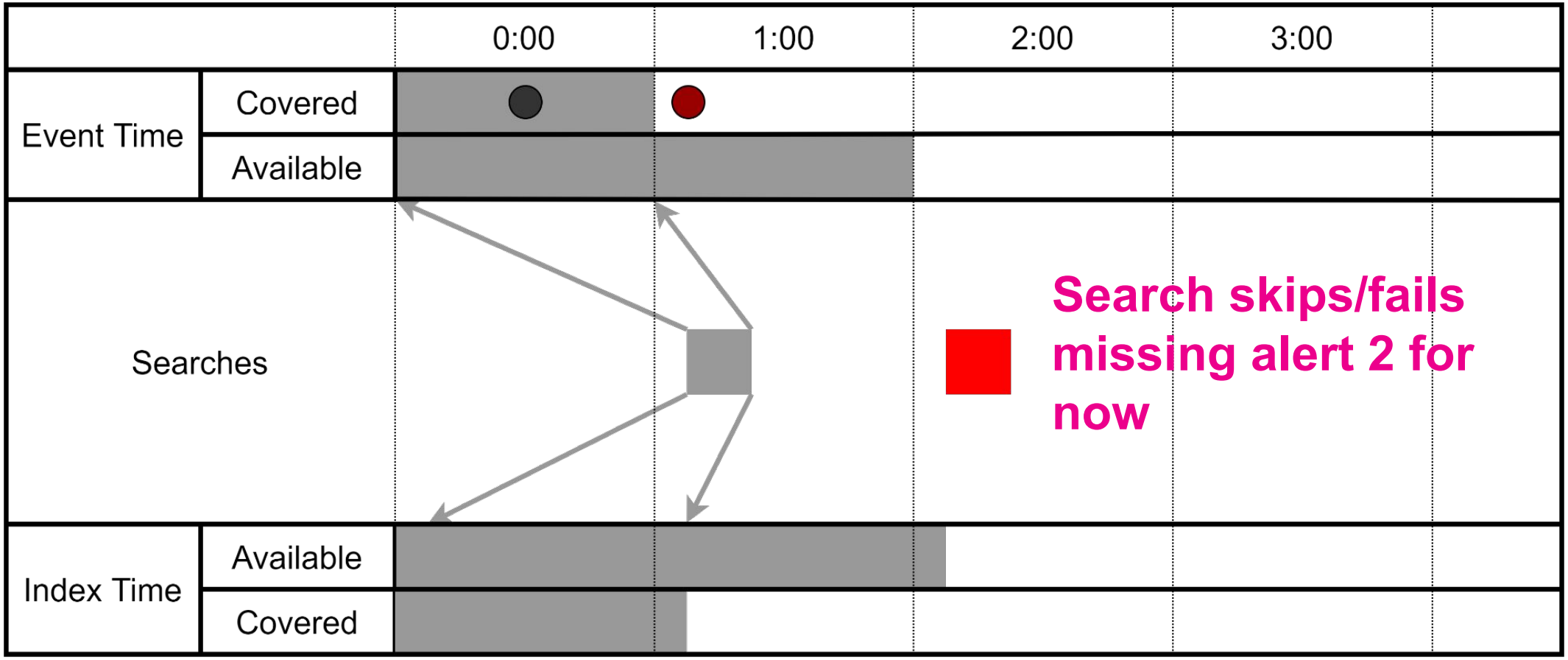
Time: 01:10 **Last Run: 01:10** **Alerts Raised: 1 of 1**

Skipped Search / SH Down / Issues | Macro Method



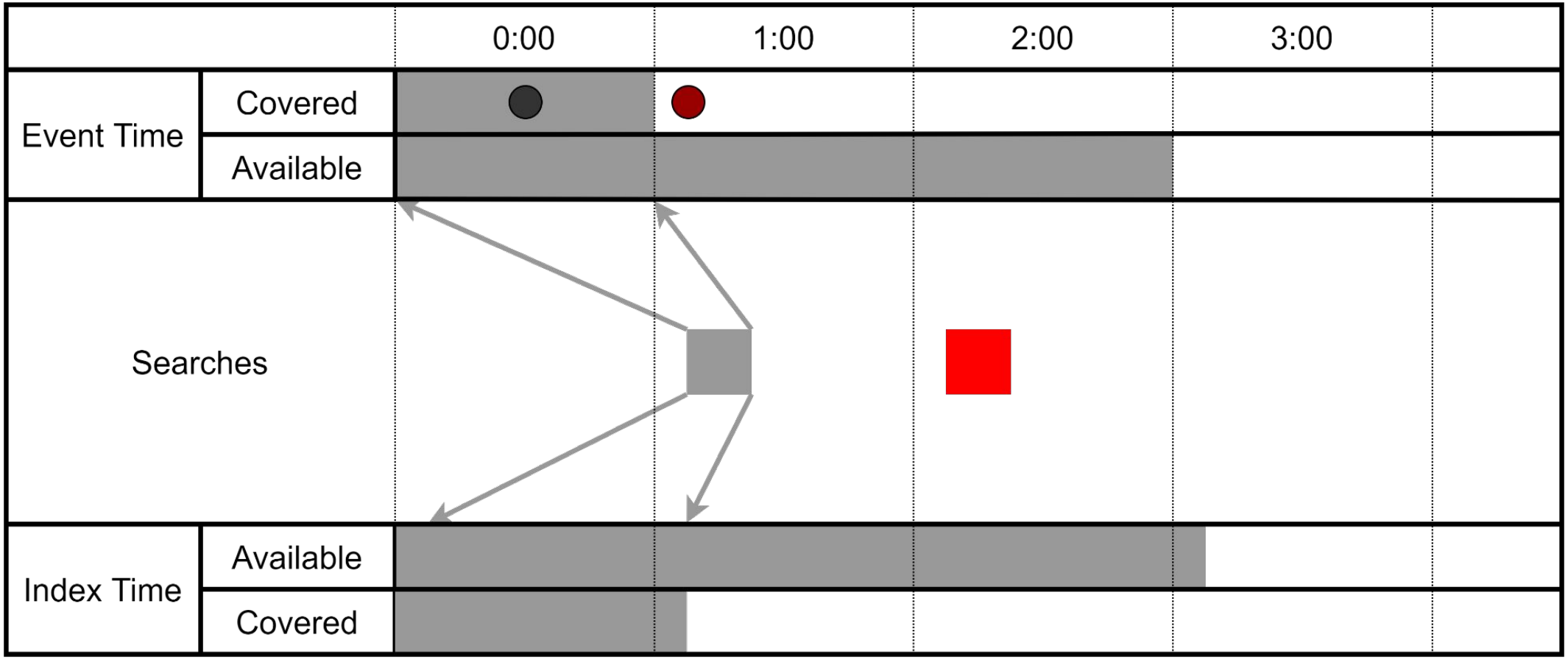
Time: 02:10 **Last Run: 01:10** **Alerts Raised: 1 of 1**

Skipped Search / SH Down / Issues | Macro Method



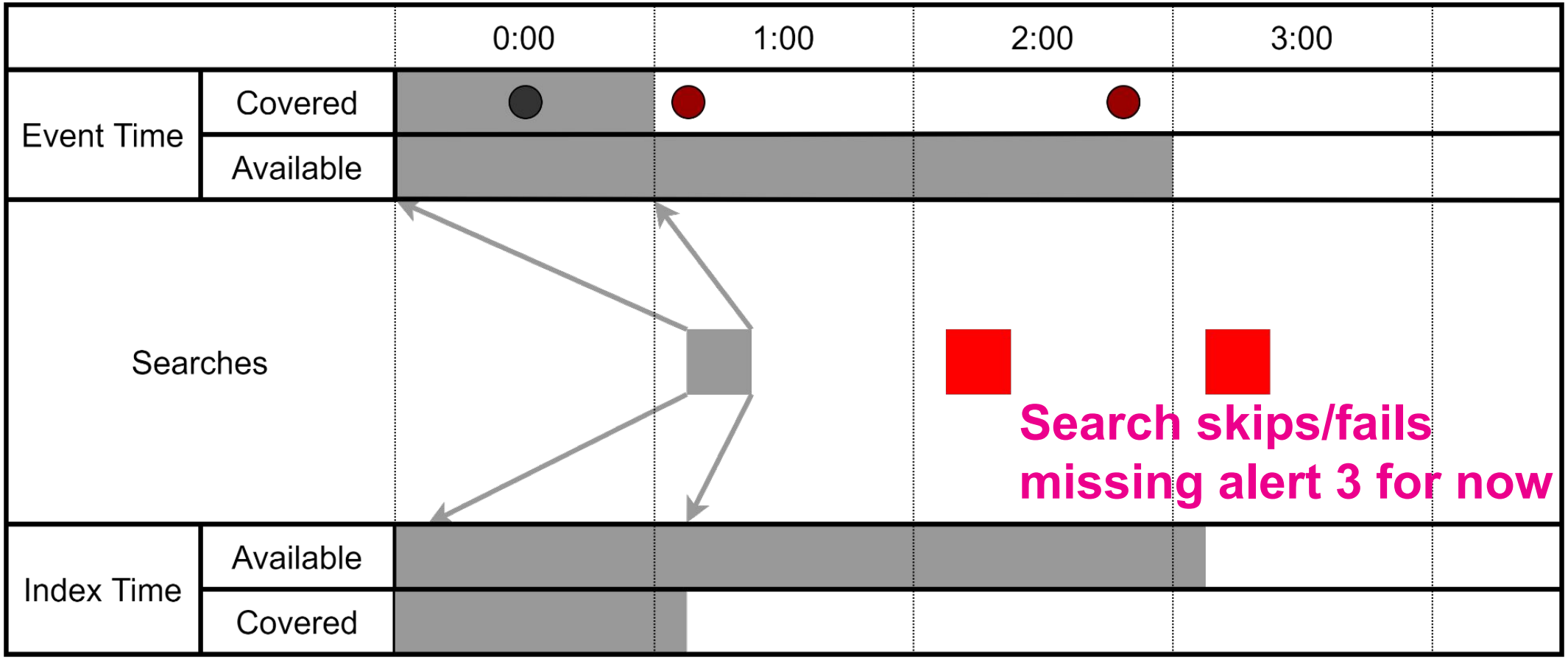
Time: 02:10 **Last Run: 01:10** **Alerts Raised: 1 of 2**

Skipped Search / SH Down / Issues | Macro Method



Time: 03:10 **Last Run: 01:10** **Alerts Raised: 1 of 2**

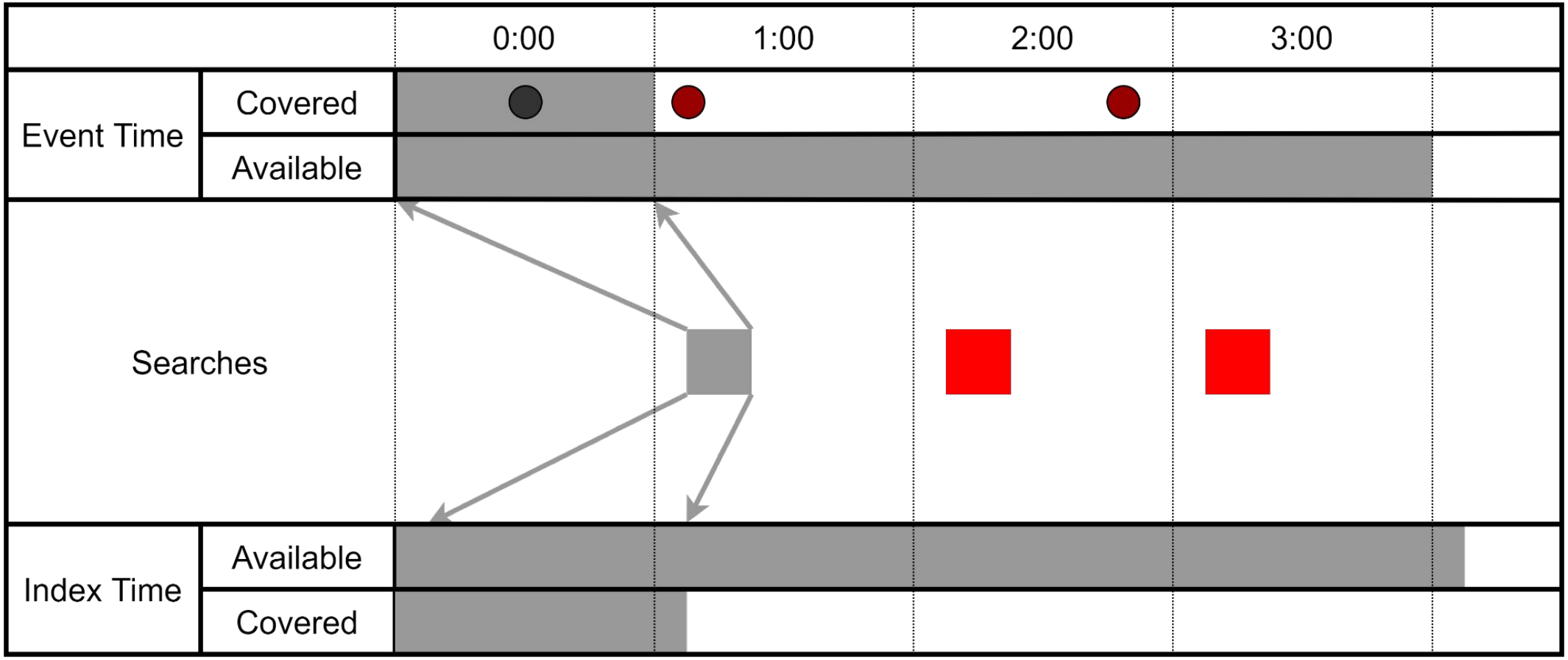
Skipped Search / SH Down / Issues | Macro Method



Time: 03:10 **Last Run: 01:10** **Alerts Raised: 1 of 3**

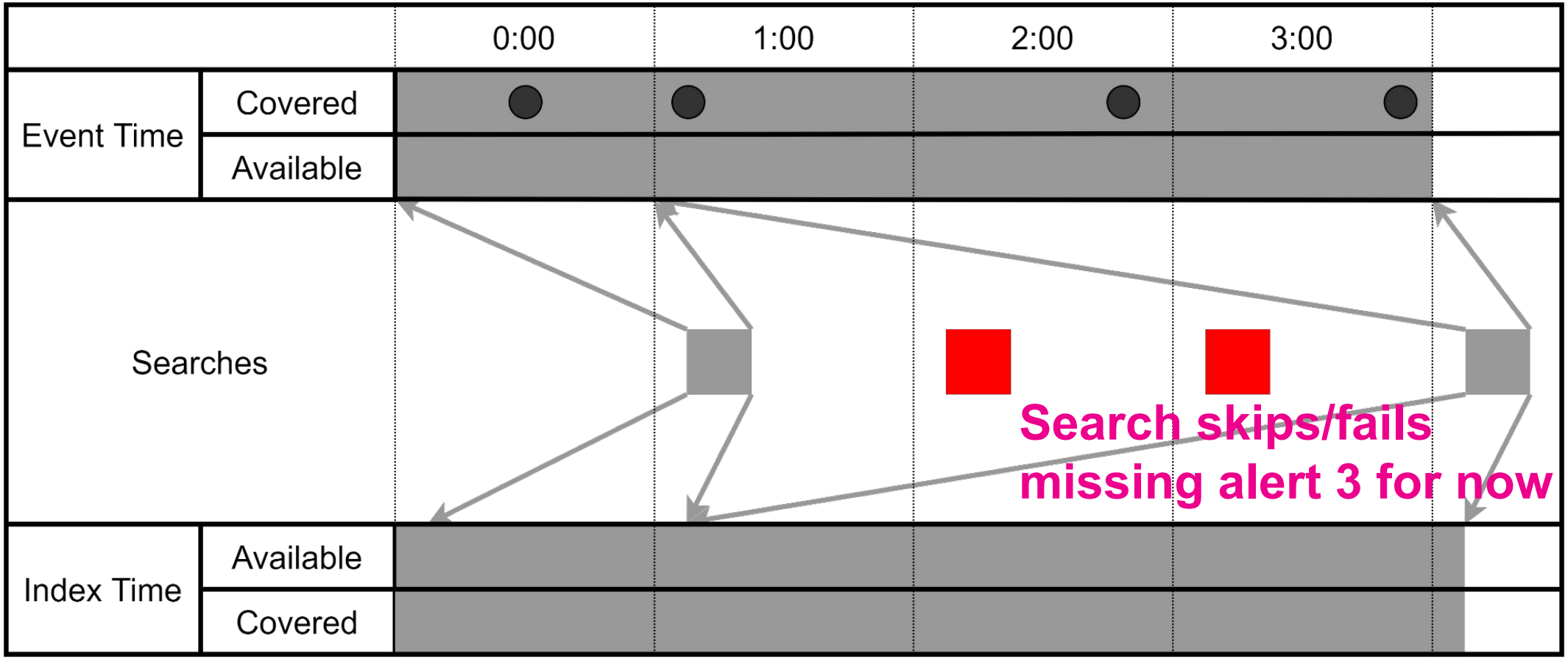
splunk> .conf21

Skipped Search / SH Down / Issues | Macro Method



Time: 04:10 **Last Run: 01:10** **Alerts Raised: 1 of 3**

Skipped Search / SH Down / Issues | Macro Method



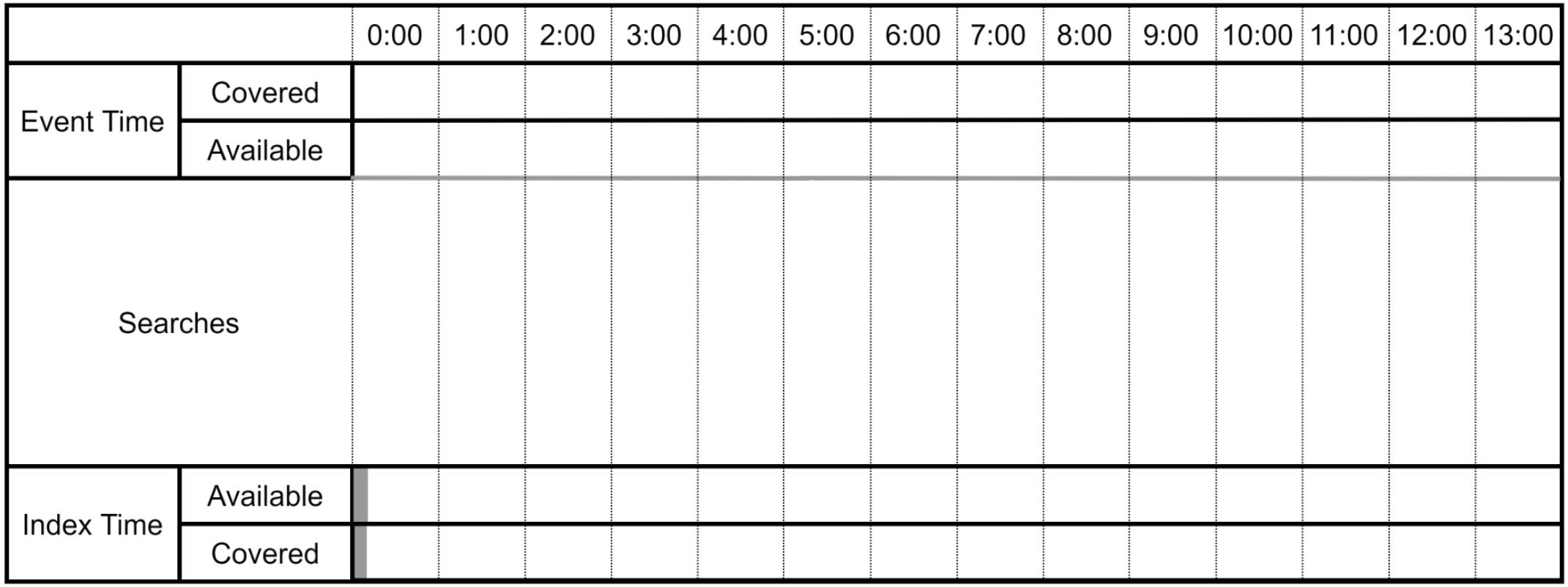
Time: 04:10 **Last Run: 04:10** **Alerts Raised: 4 of 4**

splunk> .conf21

Scenario: Skipped Searches / SH Issues Longer Time Period

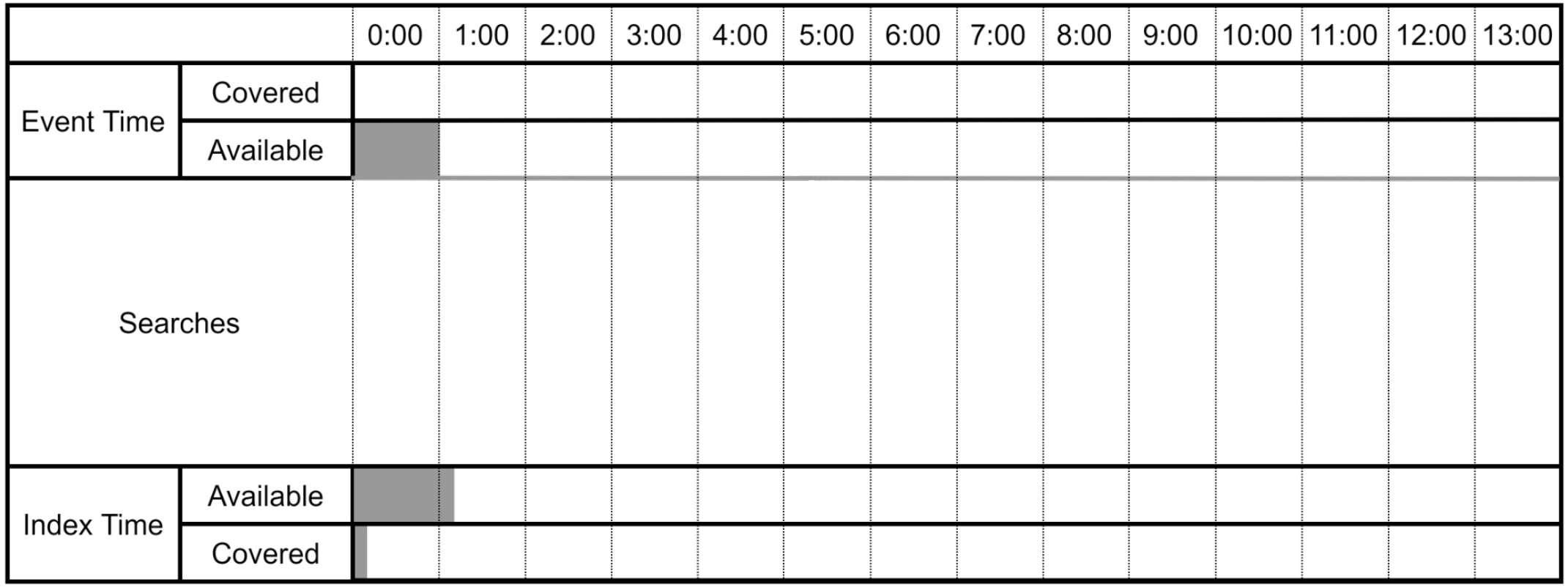
Time Source: Macro Method Searching

Skipped Search / SH Down / Issues | Macro Method



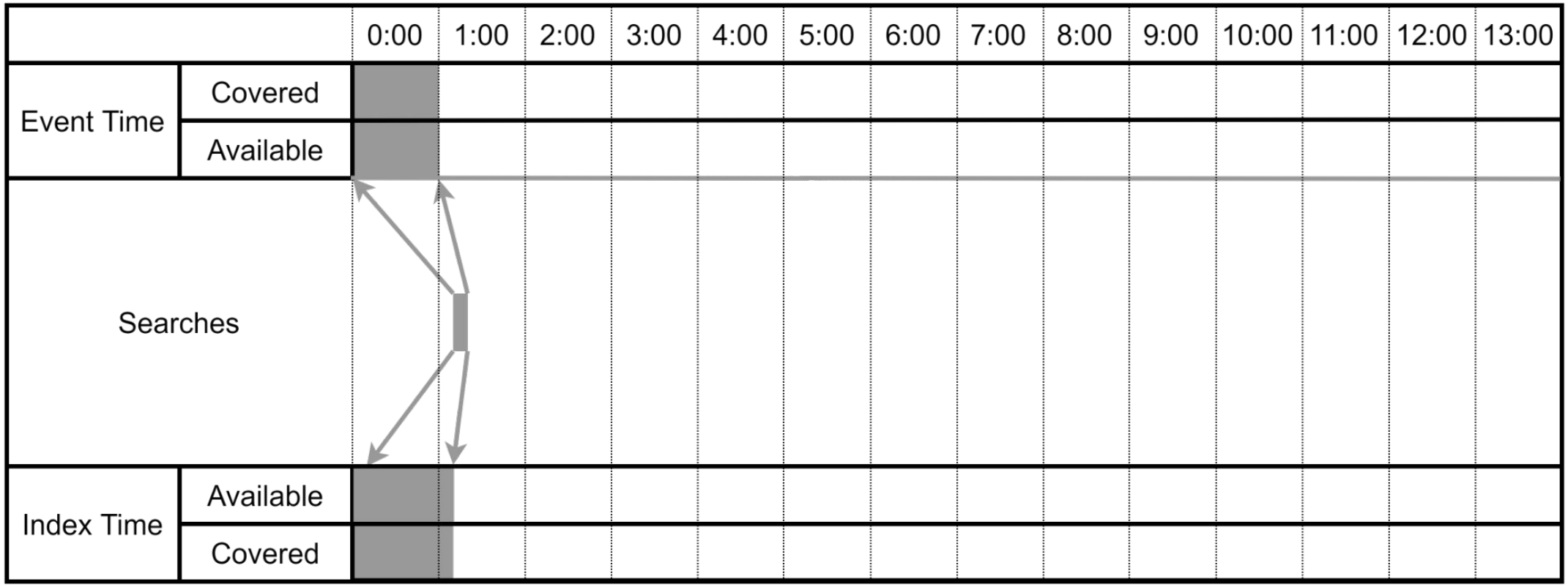
Time: 00:10 **Last Run: 00:10**

Skipped Search / SH Down / Issues | Macro Method



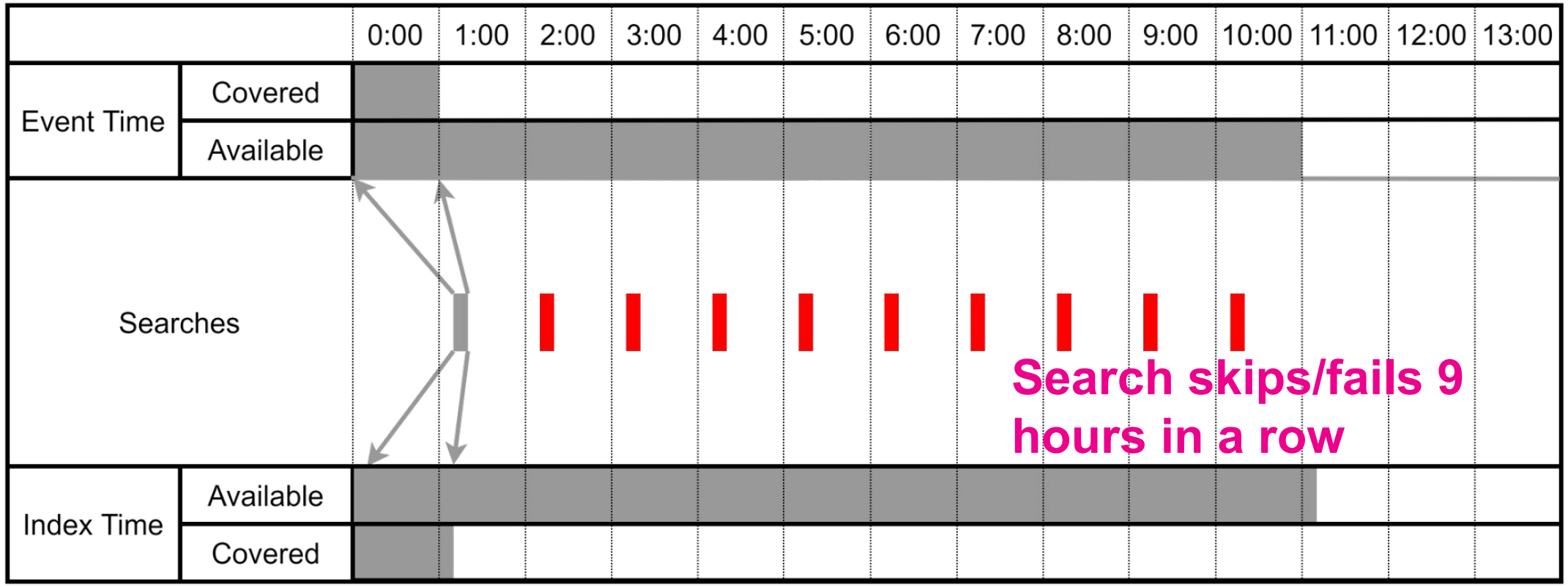
Time: 01:10 **Last Run: 00:10**

Skipped Search / SH Down / Issues | Macro Method



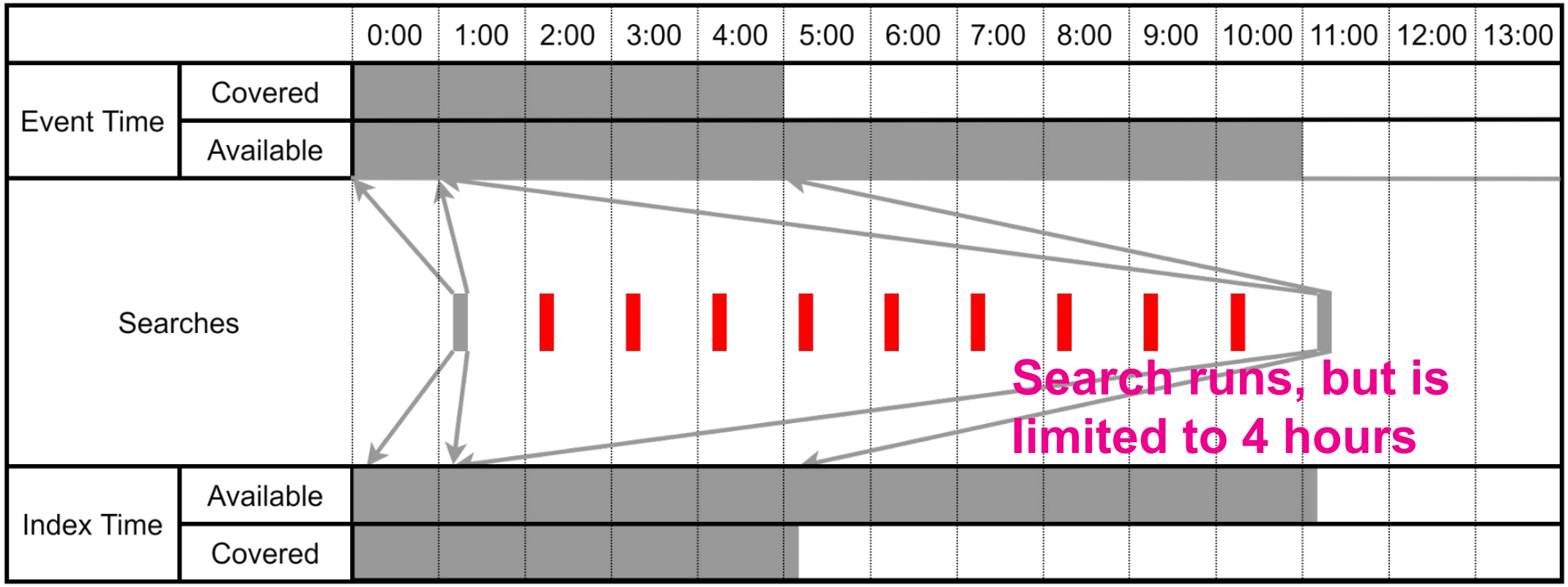
Time: 01:10 **Last Run: 01:10**

Skipped Search / SH Down / Issues | Macro Method



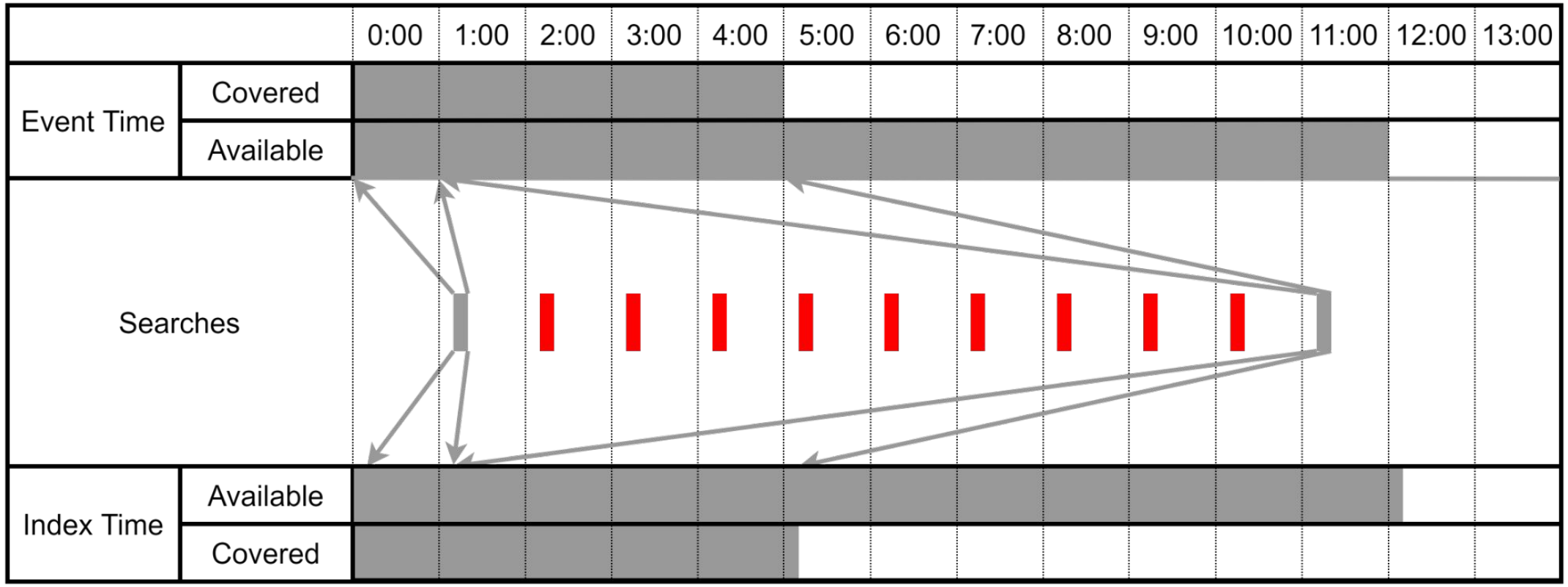
Time: 11:10 **Last Run: 01:10**

Skipped Search / SH Down / Issues | Macro Method



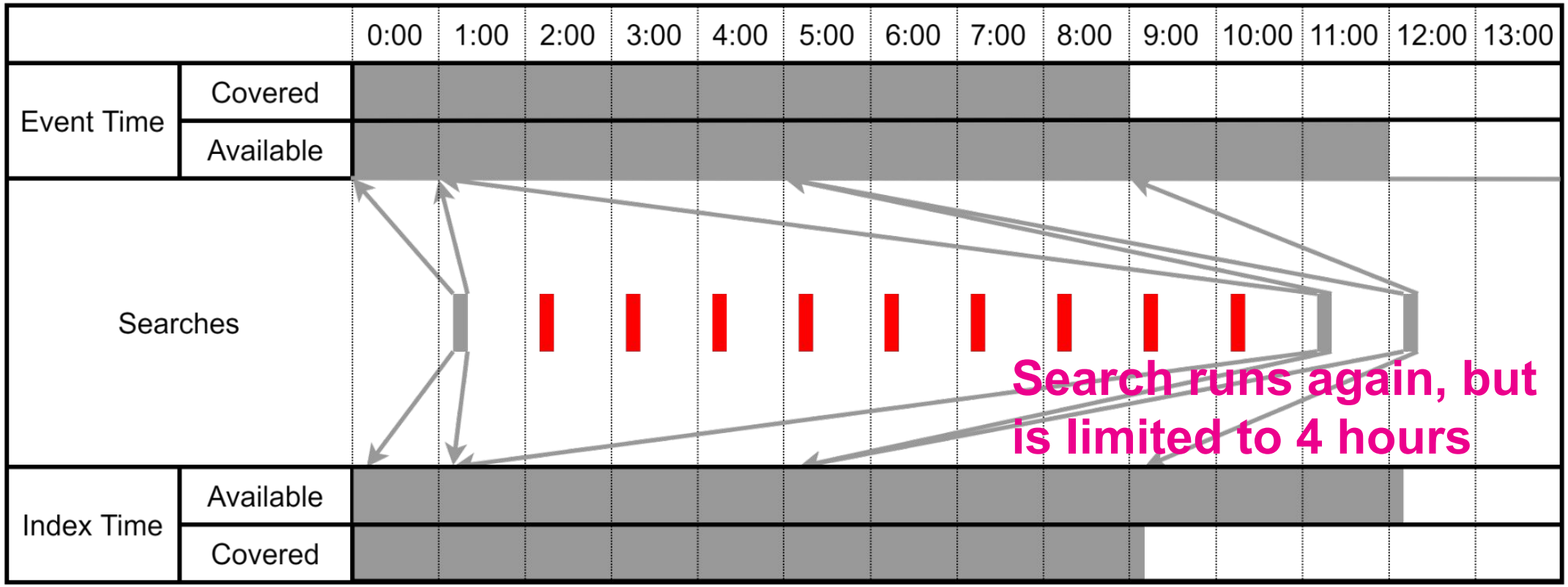
Time: 11:10 **Last Run: 05:10**

Skipped Search / SH Down / Issues | Macro Method



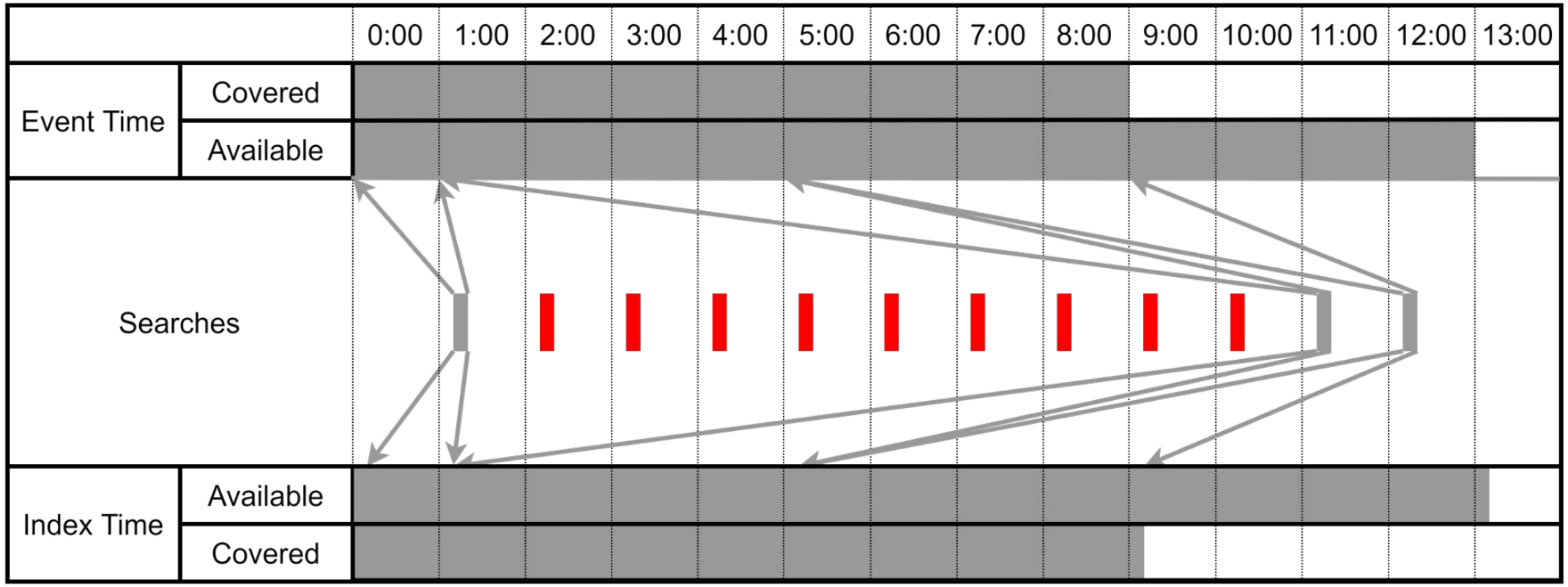
Time: 12:10 **Last Run: 05:10**

Skipped Search / SH Down / Issues | Macro Method



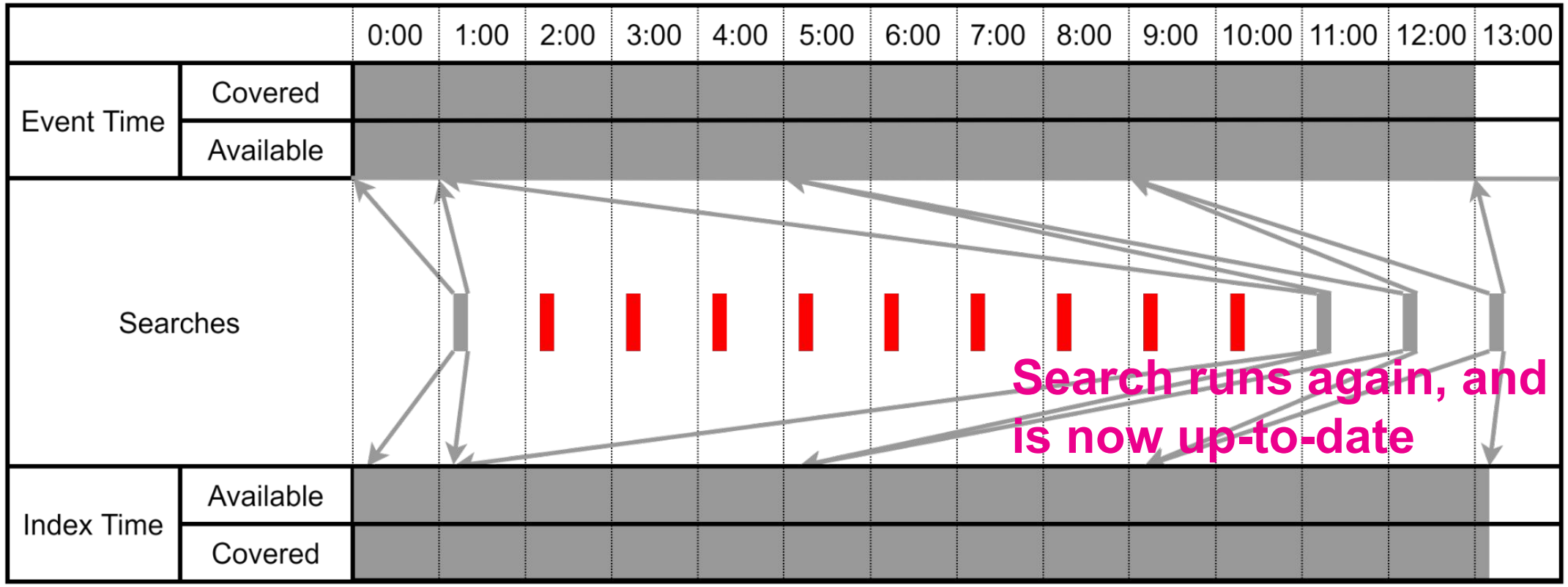
Time: 12:10 **Last Run: 09:10**

Skipped Search / SH Down / Issues | Macro Method



Time: 13:10 **Last Run: 09:10**

Skipped Search / SH Down / Issues | Macro Method



Time: 13:10 **Last Run: 13:10**

Limitations

1) Some searches need event time
   - Comparisons of counts per hour
2) Sub-searches / Multi-searches
3) Mid-search failures (failure after time already updated)
   - Memory hits a limit
   - Disk space runs out
4) Search dependencies
   - Search A generates a lookup used by search B

Advanced Use Cases with Apache Airflow

Apache Airflow is a free and open source platform created to programmatically author, schedule and monitor workflows

Airflow does not interact with Splunk out of the box

Our design:

- Commands Splunk over rest
- Can test if data is present before running a query (Limitation 1)
- Passes in time range to searches either as event or index time (Limitation 2)
- Monitors for completion / success and can parse search.log (Limitation 3)
- Can pull back results
- Uses Airflow's built-in dependency management (Limitation 4)

“So How do I Get Started?”

1

Start using a combination of earliest index time and a sliding scale

```
_index_earliest=-12h@h _index_latest=-0h@h
```

2

Stateful earliest _index_time

- Create KV Store
- Leverage/Adapt provided Macro
- Incorporate Macro in alerts
- Test, Test, Test

3

Apache Airflow

In Conclusion...

- There are real challenges with alerts you want to always run and never miss data
- Different environments are at different places along the journey
- With minimal effort (15 lines of SPL!) you can resolve almost all these challenges
- We showed you how to get started, go explore how you can improve and mature your approach to these challenges

Thank You

Please provide feedback via the

SESSION SURVEY

splunk> .conf21