Process Intelligence by ABBYY Timeline

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Gartner MQ

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Discovery & Analytics

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Goals

Optimization, Automation

- Understand the process
- Find bottlenecks
- Find inefficiencies
- Understand where time (and money) is spent

- Find opportunities for automation

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Streamline Mortgage Processing

Results:

Identified 550K+ hours of rework in the mortgage process to settlement, reduced cycle time by >6 days by automating or eliminating repetitive decisioning tasks

$1.3M

Savings in processing time

Improved customer experience, reduced cycle time and eliminated rework by identifying and following a more standard “happy” path

55%

Reduction in fulfillment time

>6 Days

Reduced from the cycle time and 44k hours of effort saved

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Multinational Telecom Company:

Process Intelligence Case Study

International communications vendor drives all operational improvement and automation through data driven insight. Using ABBYY's Process Intelligence leads to an estimated saving of $8M per year.

GOALS:

- Identify and justify processes for automation consumer support and truck rolls

RESULTS:

- Identified 9 solutions areas including multiple opportunities for Automation, Virtual Agents, and AI / Machine Learning
- Identified $8M in savings in first 6 weeks
- An estimated 70% reduction in time and cost, compared to historic manual efforts

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Contact Center – Minimum Data Set (MDS) Compliance Use Case

The Contact Center implemented a Protocol of collecting and verifying patient information to reduce insurance claims denials using process insights from ABBYY Timeline

GOALS:

- Reduce front-end denials and re-processing expense for insurance claims
- Improve quality of patient information collection during scheduling of patient services/procedures
- Identify opportunities to improve workforce optimization and compliance with processes

RESULTS:

- Compliance rate with accurate data collection increased from 40% to 87%
- Audit team is now able to monitor compliance for 100% of all scheduler interactions with patients; up from ~5% before Timeline

French Multinational Insurance Company

Challenge:

Our client's primary goal was to streamline the auto claim handling process and improve the overall customer experience by reducing cycle times, reducing rework, and increasing the rate of process automation.

Solution:

ABBYY Timeline was deployed on-premise following specific customer guidelines.

Over 4,600 motor claims and 500,000 events were loaded by extracting and transforming transactional logs produced by the claim management system.

Results:

200+ hours per claim spent in manual tasks were identified using ABBYY Timeline.

More than 50 FTEs were identified as potential savings by automating document processing manual tasks.

Opportunity to reduce settlement times from 8 to 5 months.

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Basics

Event record

id, timestamp, event name, attributes

Timestamp	ACUITY_LEVEL_C	Comments	MEANS_OF_ARRV_C	TimelineID	DayOfWeek	Name
3/1/2012 0:07	13	ORDER FOR PATIENT SERVICES	Ambulance	113605460	Thu	ADT ORDER PLACED

Timeline

Case, trace

Timestamp	ACUITY_LEVEL_C	Comments	MEANS_OF_ARRV_C	TimelineID	DayOfWeek	Name
3/1/2012 0:07	13	ORDER FOR PATIENT SERVICES	Ambulance	113605460	Thu	ADT ORDER PLACED
3/1/2012 0:07	13	ED Disposition set to Admitted	Ambulance	113605460	Thu	Ready for Admit
3/1/2012 0:08	13	LACTIC ACID	Ambulance	113605460	Thu	Lab Ordered
3/1/2012 0:21	13	CALCIUM, IONIZED, PHOSPHORU	Ambulance	113605460	Thu	Lab Ordered
3/1/2012 1:42	13	(Final result) LACTIC ACID, W BLO	Ambulance	113605460	Thu	Lab Resulted
3/1/2012 1:56	13	(Final result) PT/INR	Ambulance	113605460	Thu	Lab Resulted
3/1/2012 1:58	13	(Preliminary result) CBC/DIFF	Ambulance	113605460	Thu	Lab Resulted
3/1/2012 2:02	13	(Final result) TROPONIN T	Ambulance	113605460	Thu	Lab Resulted
3/1/2012 2:02	13	(Preliminary result) CK WITH MB	Ambulance	113605460	Thu	Lab Resulted
3/1/2012 2:03	13	CTA HEAD W/ CONTRAST	Ambulance	113605460	Thu	CT ORDER PLACED
3/1/2012 2:07	13		Ambulance	113605460	Thu	CT ORDER RELEASED
3/1/2012 2:09	13	(Final result) CK WITH MB	Ambulance	113605460	Thu	Lab Resulted
3/1/2012 2:09	13	(Final result) BASIC METAB PANE	Ambulance	113605460	Thu	Lab Resulted

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Timeline

Single Timeline

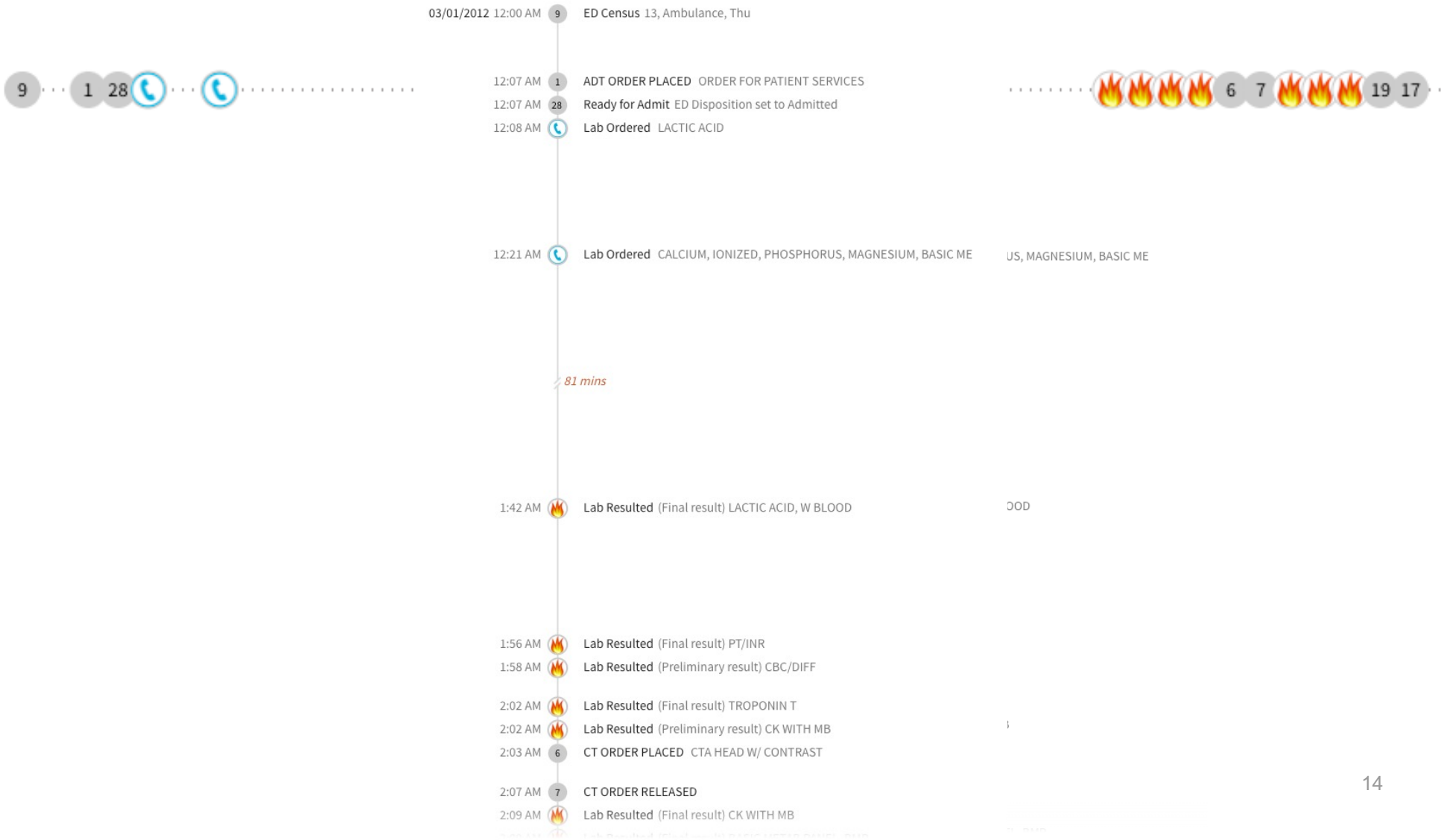
One in a million

Single Timeline View

Details

Subprocesses

Automatically discovered



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Timeline Set

Timeline Set

Filters

Timestamp	ACUITY_LEVEL_C	Comments	MEANS_OF_ARRV_C	TimelineID	ROOM_ID	DayOfWeek	Name
3/1/2012 0:01	15	WOLF, M assigned as Physician Ass	Personal Vehicle	113605580		Thu	Provider Assigned
3/1/2012 0:01	15		Personal Vehicle	113605602		Thu	Patient arrived in ED
3/1/2012 0:01	15	BENKINNEY, J assigned as Attendin	Personal Vehicle	113605580		Thu	Provider Assigned
3/1/2012 0:01	14		Personal Vehicle	113605592		Thu	Triage Started
3/1/2012 0:01	15	From room 5 to room D08	Other	113605469	915	Thu	Patient transferred
3/1/2012 0:01	12	ED Disposition set to Discharged	Ambulance	113604652		Thu	Ready for Discharge
3/1/2012 0:01	15	First ED Provider Contact	Personal Vehicle	113605580		Thu	First ED Provider Contact
3/1/2012 0:01	14	ED Disposition set to Discharged	Personal Vehicle	113603880		Thu	Ready for Discharge
3/1/2012 0:02	13	BENKINNEY, J assigned as Attendin	Ambulance	113604919		Thu	Provider Assigned
3/1/2012 0:03			Ambulance	113605605		Thu	Patient arrived in ED
3/1/2012 0:03	15		Personal Vehicle	113605297		Thu	Ready for Discharge
3/1/2012 0:03	14		Personal Vehicle	113605592		Thu	ED Class set to Emergency
3/1/2012 0:04	14		Personal Vehicle	113605592		Thu	Triage Completed
3/1/2012 0:04			Ambulance	113605605		Thu	Triage Started
3/1/2012 0:04	14	To room 7	Personal Vehicle	113605592	824	Thu	Patient roomed in ED
3/1/2012 0:05			Ambulance	113605605		Thu	Triage Completed
3/1/2012 0:05	15	From room 2 to room D01	Personal Vehicle	113605297	100322	Thu	Patient transferred
3/1/2012 0:06	15	LOW SENSITIVITY CRP, SEDIMENTA	Personal Vehicle	113605470		Thu	Lab Ordered
3/1/2012 0:06	14	LACTIC ACID, LIPASE, HEP FUNCTIO	Ambulance	113605516		Thu	Lab Ordered
3/1/2012 0:07	15		Personal Vehicle	113605602		Thu	Triage Started
3/1/2012 0:07		To room 19	Ambulance	113605605	9118	Thu	Patient roomed in ED
3/1/2012 0:07	13	ORDER FOR PATIENT SERVICES	Ambulance	113605460		Thu	ADT ORDER PLACED
3/1/2012 0:07	13	ED Disposition set to Admitted	Ambulance	113605460		Thu	Ready for Admit
3/1/2012 0:08	15		Personal Vehicle	113605297		Thu	Patient departed from ED
3/1/2012 0:08	13		Personal Vehicle	113603797		Thu	Ready for Discharge
3/1/2012 0:08	15		Personal Vehicle	113605297	100322	Thu	Patient discharged
3/1/2012 0:08	13	LACTIC ACID	Ambulance	113605460		Thu	Lab Ordered
3/1/2012 0:08	15	CH50, TOTAL	Personal Vehicle	113605470		Thu	Lab Ordered
3/1/2012 0:09	14	(Final result) ANKLE, 3+ VIEWS	Personal Vehicle	113605513		Thu	Rad Resulted
3/1/2012 0:09	14	(Final result) FOOT, 3+ VIEWS	Personal Vehicle	113605513		Thu	Rad Resulted

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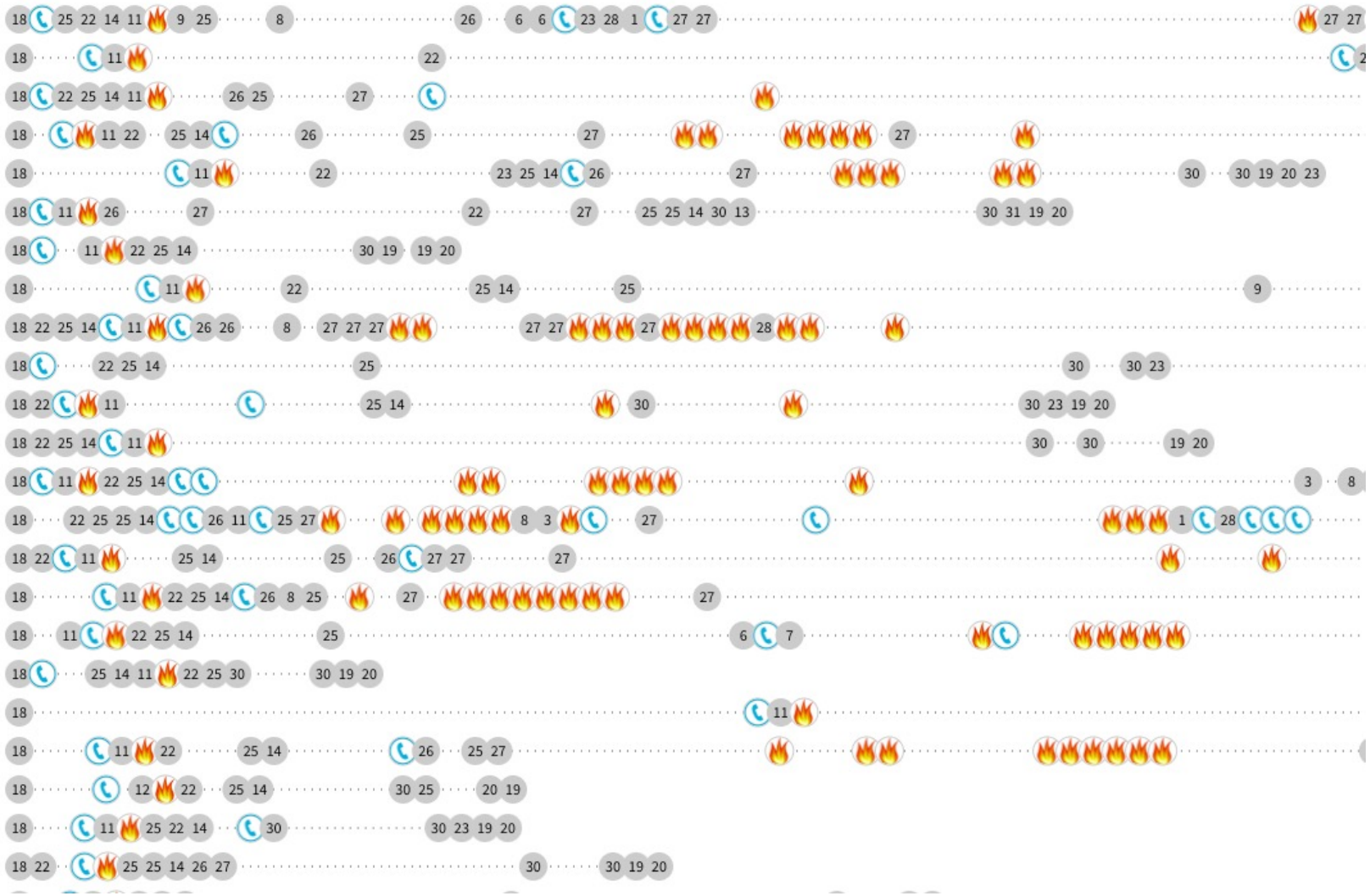
Timeline Set

Timeline Set

Filters



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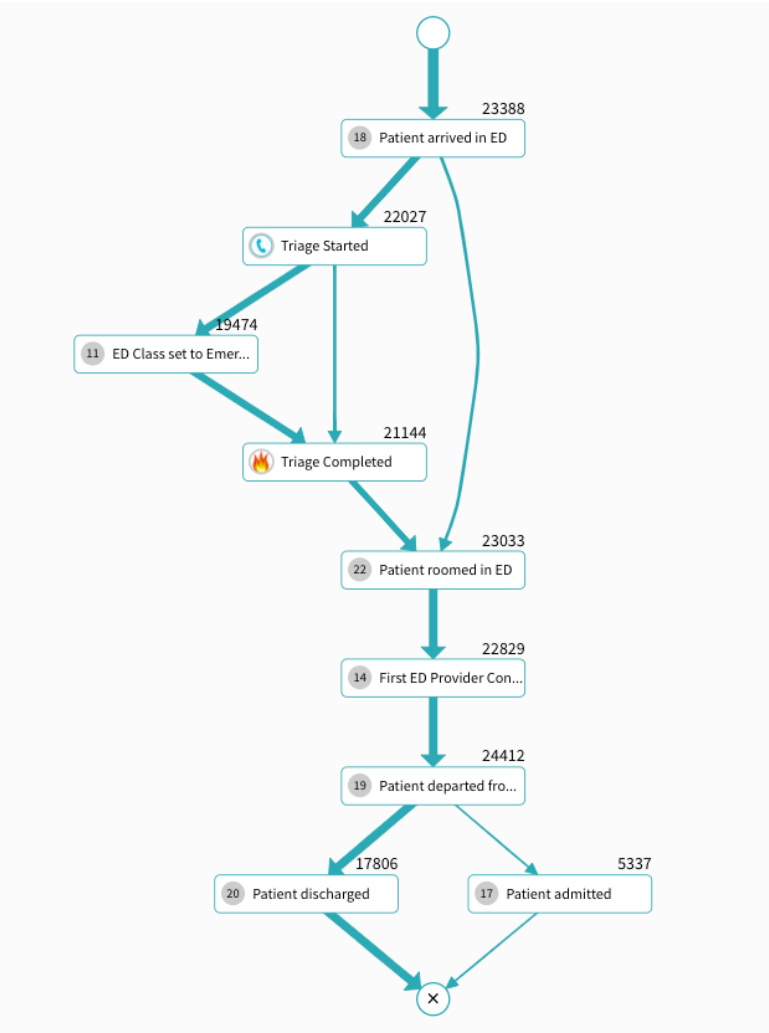
Paths

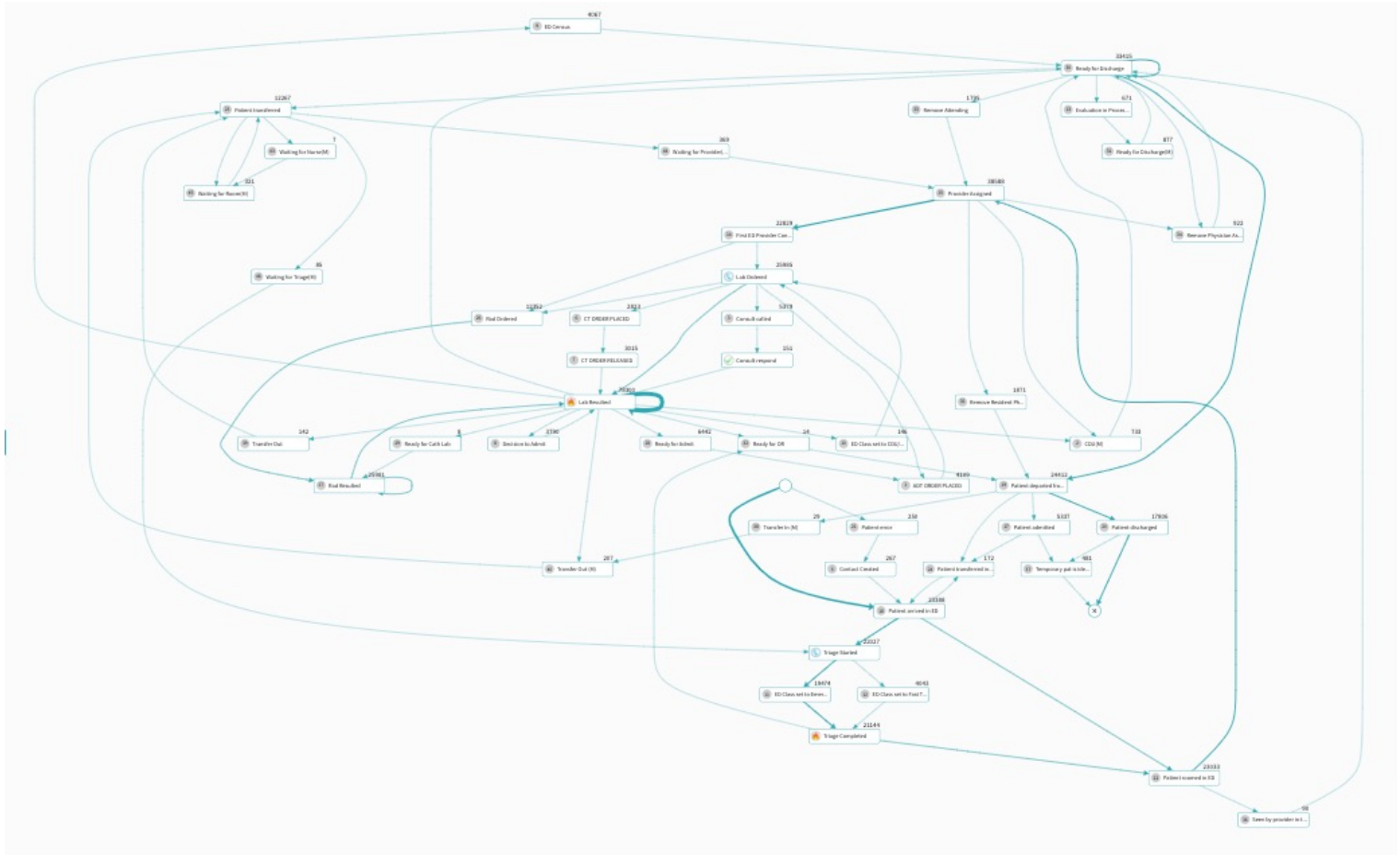

04/19/2012 11:51 PM
18
Patient arrived in ED
11:53 PM
Triage Started


03/12/2012 12:54 PM
18
Patient arrived in ED
1:04 PM
Triage Started


03/27/2012 3:54 PM
18
Patient arrived in ED
3:55 PM
Triage Started

Schema





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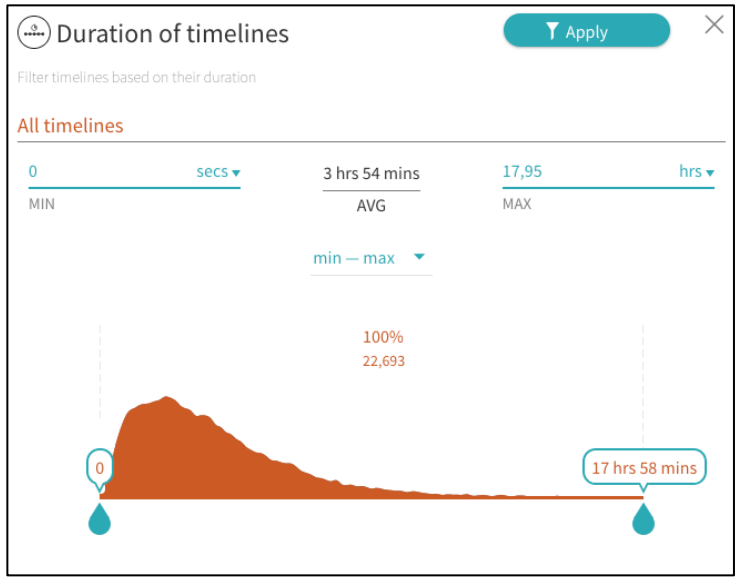
Filters and Sets

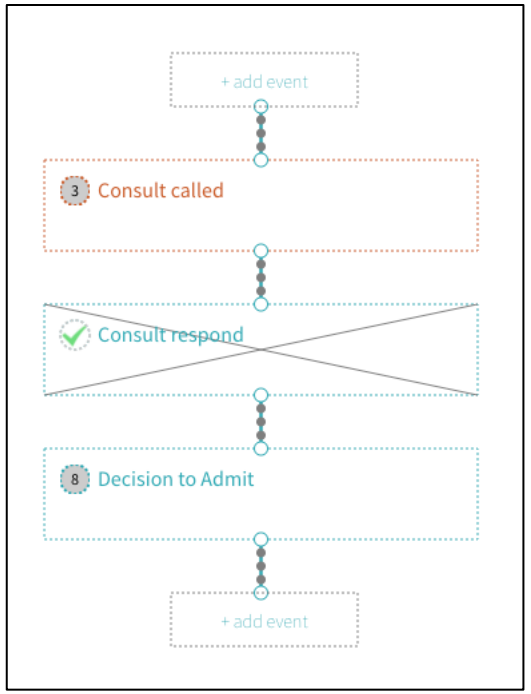
01 Metrics

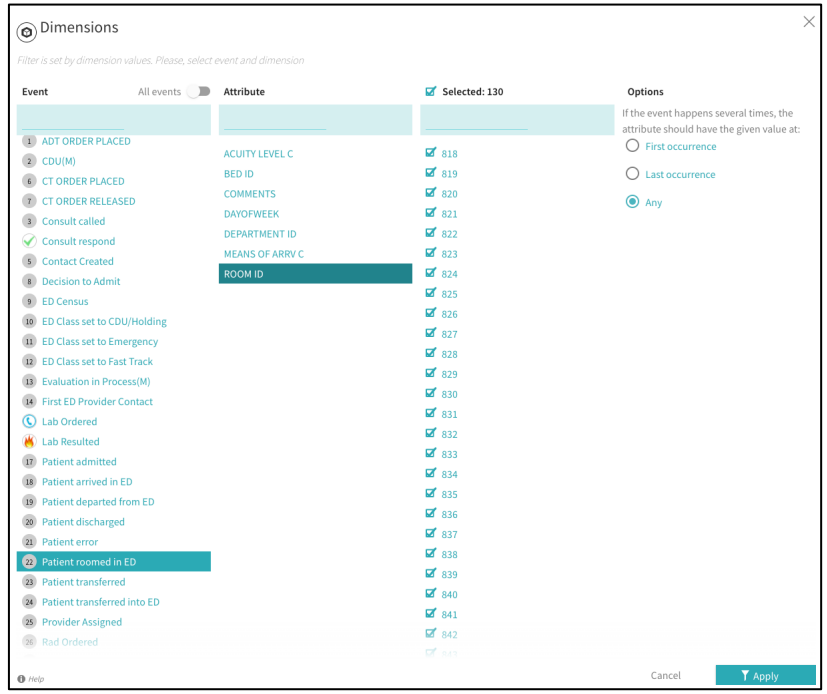
- Histogram of pre-defined metrics
- Time range
- Time between specific events



02 Dimension

- Select one or more attribute values





03 Query

- User defined pattern

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Process schema

Generate a directly-follows graph on selected milestones

01 Milestones

- Events that always happen at the same position relative to each other
- ,,You are American if other Americans say you are one''

02 Schema generation

- Directly-follows graph on milestones
- Manual edit

03 Quantitative analysis

- Display stats on the graph
- Visual bottleneck search via animation

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Paths analysis

Compare event permutations

01 Events

- User selects events to include

02 Path statistics

- User selects two stats to be displayed per permutation
- Manual edit

03 Quantitative analysis

- Stats on transitions
- Compare paths in different sets

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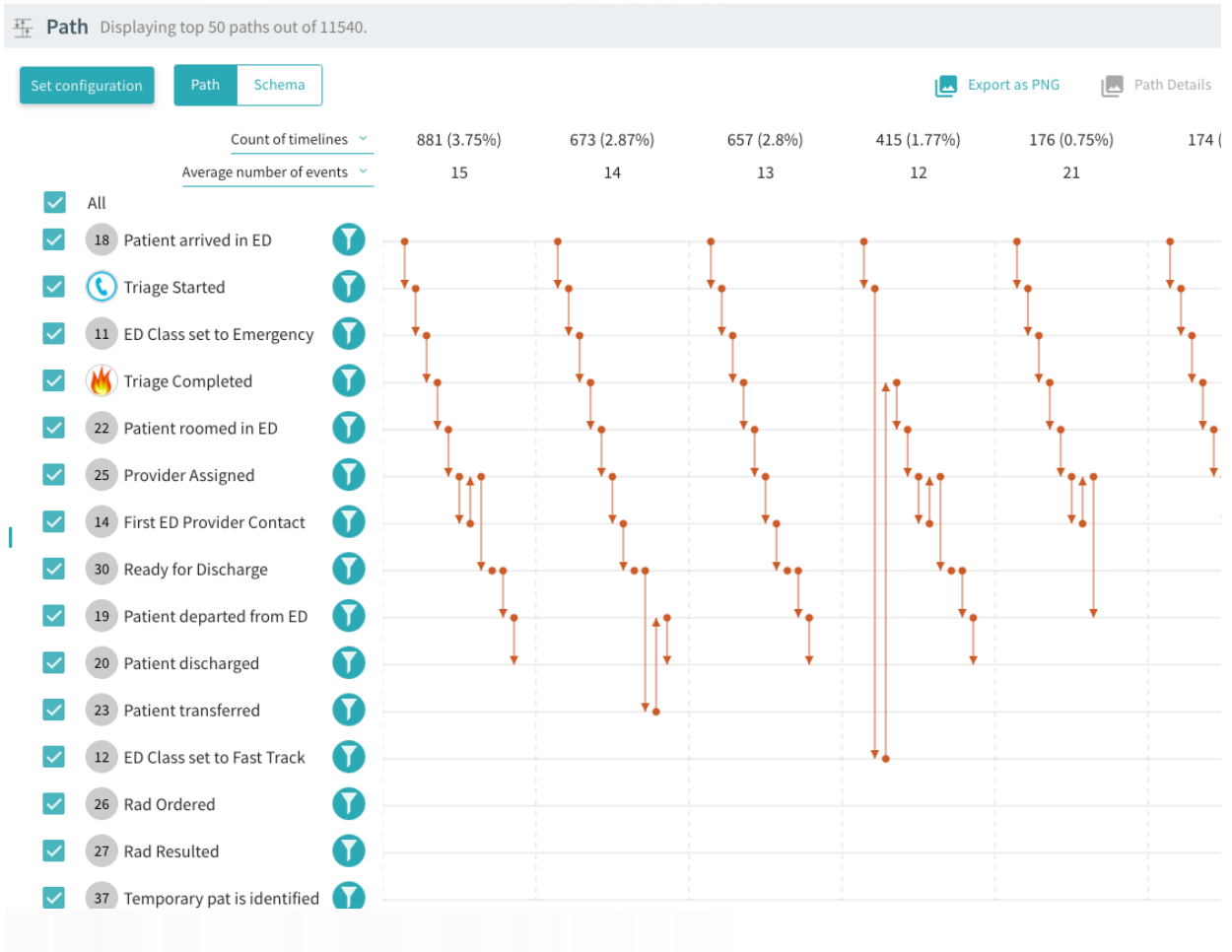


Interval analysis

Histogram of time spent between two selected events

01 Events

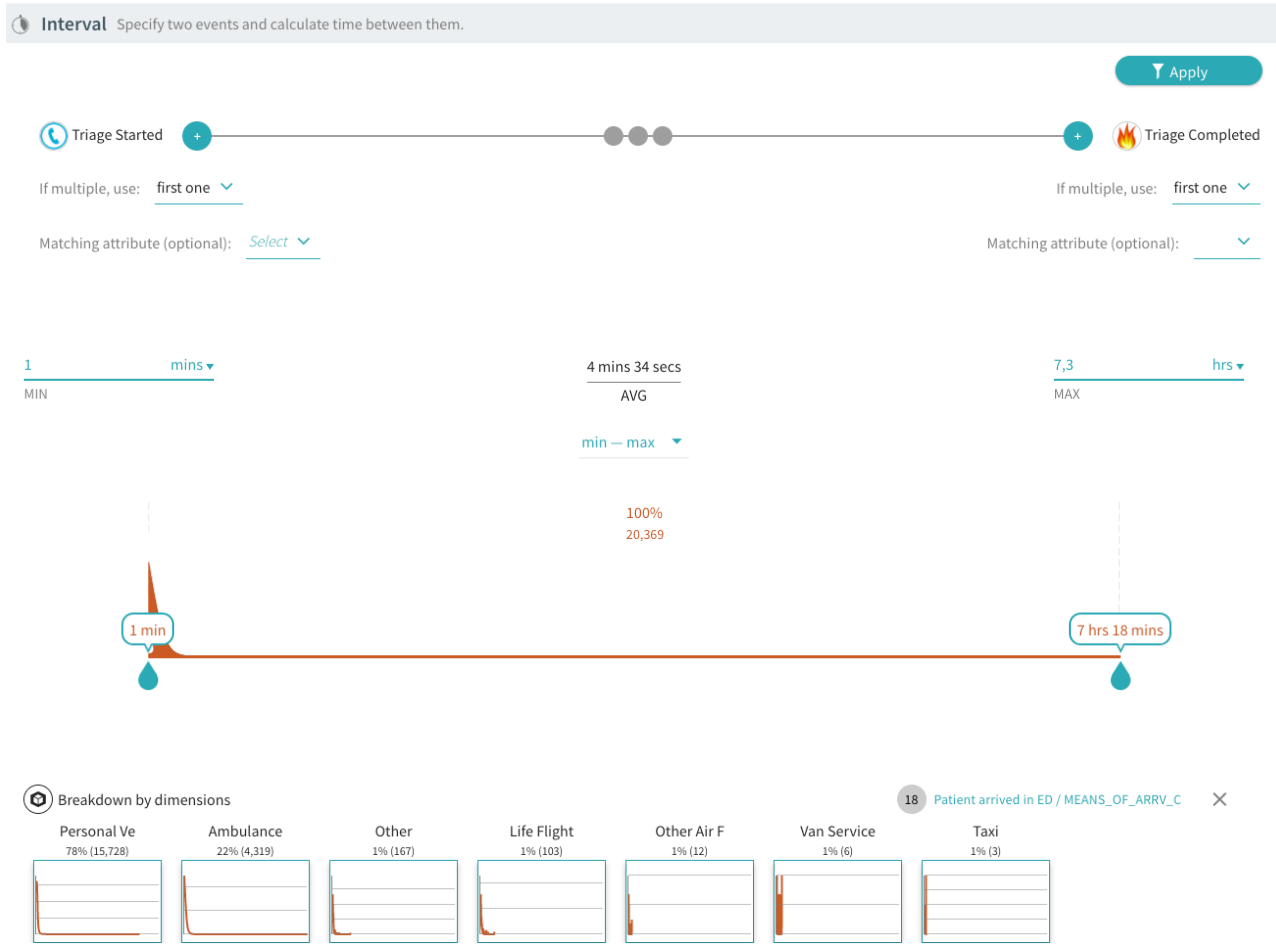
- User selects start and end events

02 Interval statistics

- Histogram of time spent between the two events
- Min/max, 75, 90 percentiles

03 Breakdown by dimension

- User selects an attribute
- Subcharts for each attribute value



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Breakdown analysis

Histogram of attribute values

01 Dimension

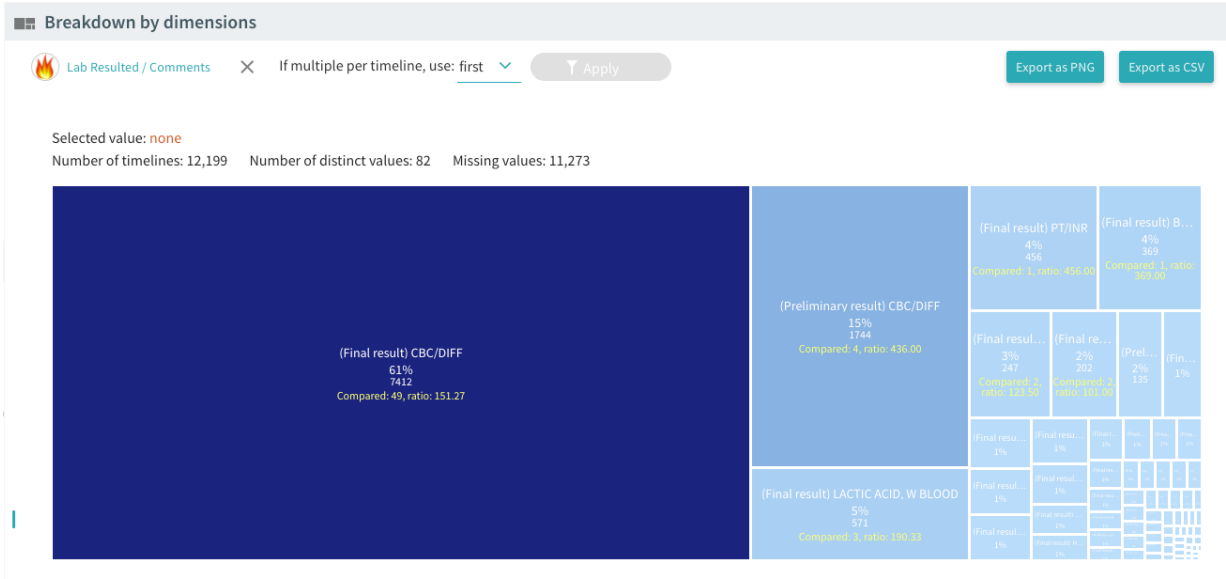
- User selects an event/attribute pair

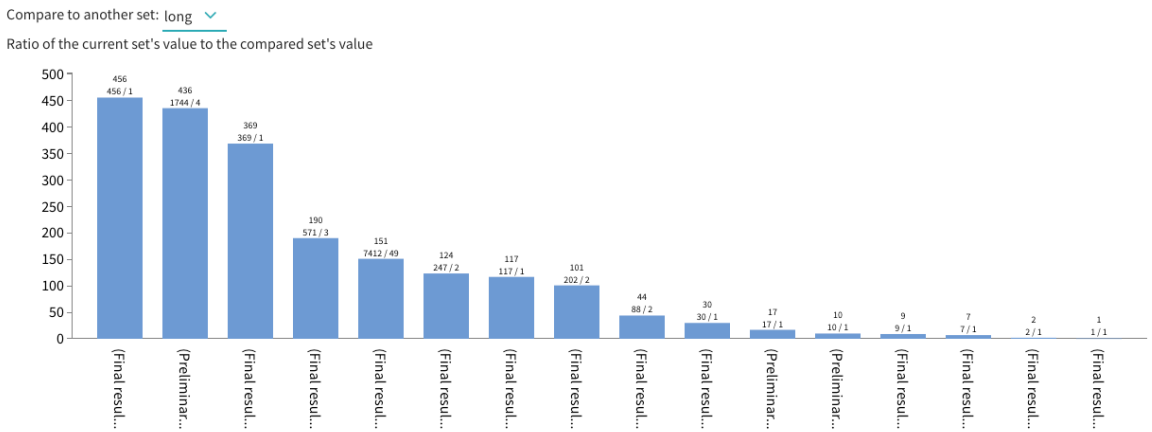
02 Dimension statistics

- Histogram of attribute values
- Basic stats

03 Compare to set

- User selects another set
- Ratio of the current set's value to the compared set's value





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Monitoring & Alerting

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Goals

Measure performance and effect of change

- Optimization, automation changes
- Continuous performance monitoring (of human, non-automated workforce)

- Automation

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French multinational investment bank and financial services company

Challenge:

Our client's main goal was to identify and eliminate non-conforming transactions in order to reduce treasury immobilisation as part of the SEPA payments.

Solution:

ABBYY Timeline was deployed on-premise following specific customer guidelines.

Several customized dashboards with key KPIs were built to be used in daily reports and meetings.

Alerts are being sent to notify users about potential issues in the process.

Results:

- The number of RECALLED payments has been reduced by 55%
- Different analysis were built around top 20 problematic customers and top 20 non-conforming banks
- Fully transparency and traceability of banks that cannot execute recalls in the allotted time

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Fortune 100 financial services firm

Results:

A Fortune 100 financial services firm with over $1 trillion under management and 5M+ clients turned to ABBYY to monitor transactions and mitigate regulatory risk for investor onboarding.

100%

Transactions are now monitored for compliance to avoid regulator sanctions

>$2 mil

Savings per year with process automation

Reduced risk of compliance violation with regulators and exposure from fines or PR scenarios

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ETL

Repository to manipulate data prior loading it to a project

01 Extract

- Manual upload
- SFTP
- Import from 3rd party

02 Transform

- Type conversion
- String manipulation
- Join
- New column
- Delete
- Random sample

03 Load

- Load all data
- Load with filters

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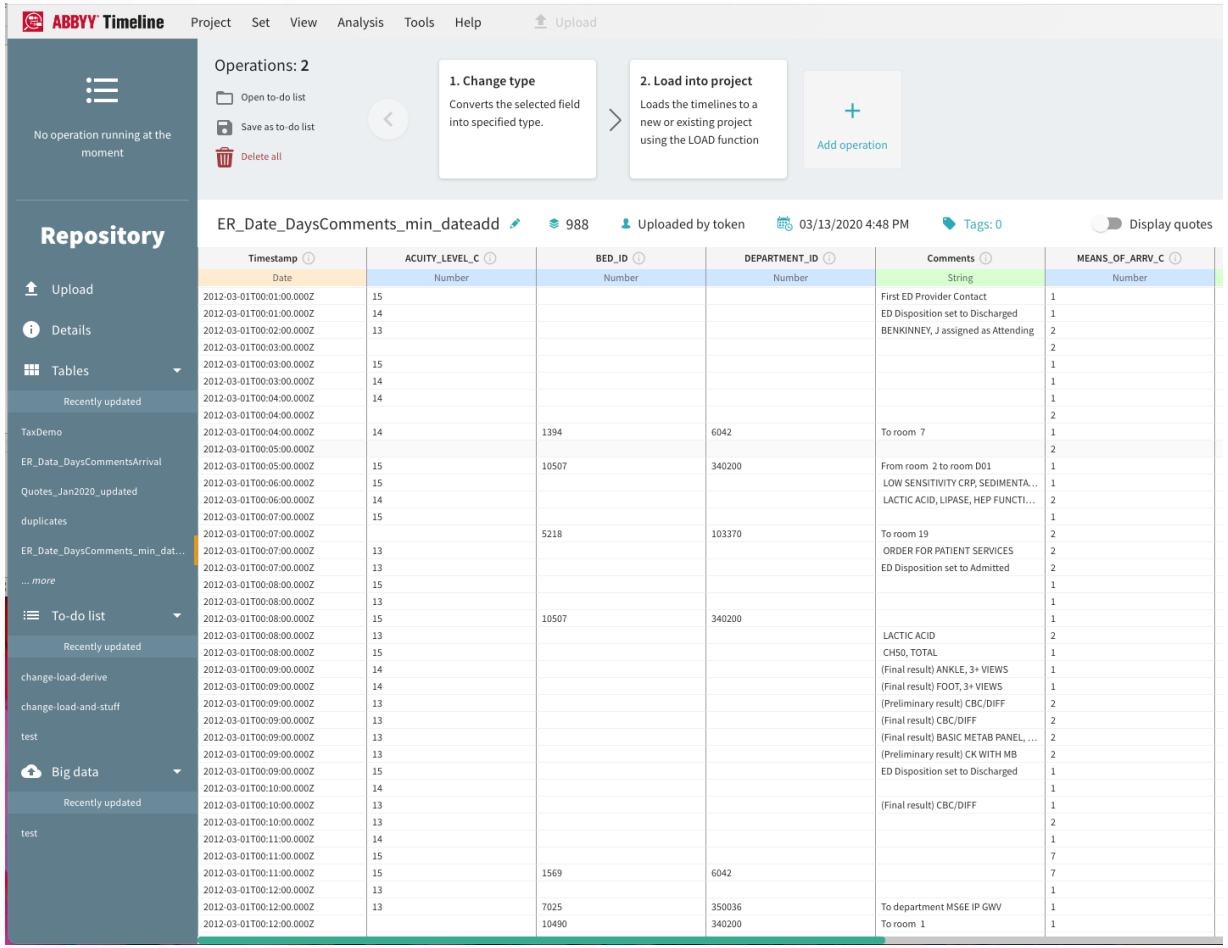

Process monitoring

Periodic upload into a project; check alert conditions every time

01 Upload

- Manual via browser
- Sftp
- Timeline API
- RabbitMQ

02 Alert

- User defines alert conditions
- Who to send the alert to
- In-app, email, sms, webhook

03 Real-time alert

- Events arrive via RabbitMQ
- Worker adds new data and runs alert processing

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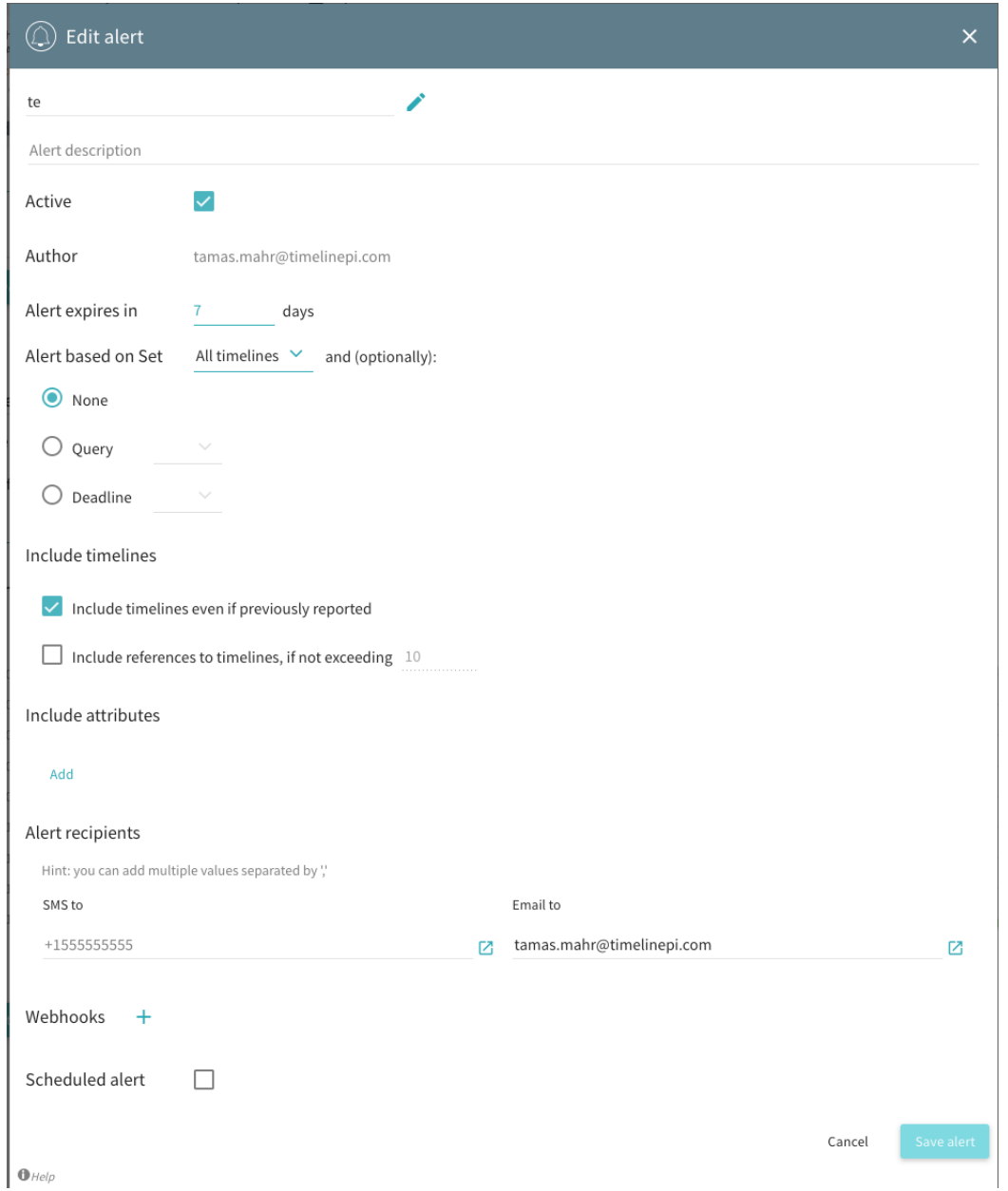

Prediction

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Goals

Improved alerting

- Alert users before it happens
- Prescriptive:
    - Tell users what to do to prevent it happening

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Outcome forecast

Predict the outcome of a process

01 Outcomes

- A set of events define an outcome

02 Training

- NN inputs:
  - Event sequences
  - Additional attributes

03 Prediction

- Based on the defined input classify timelines into outcomes
- Filter based on predicted outcome

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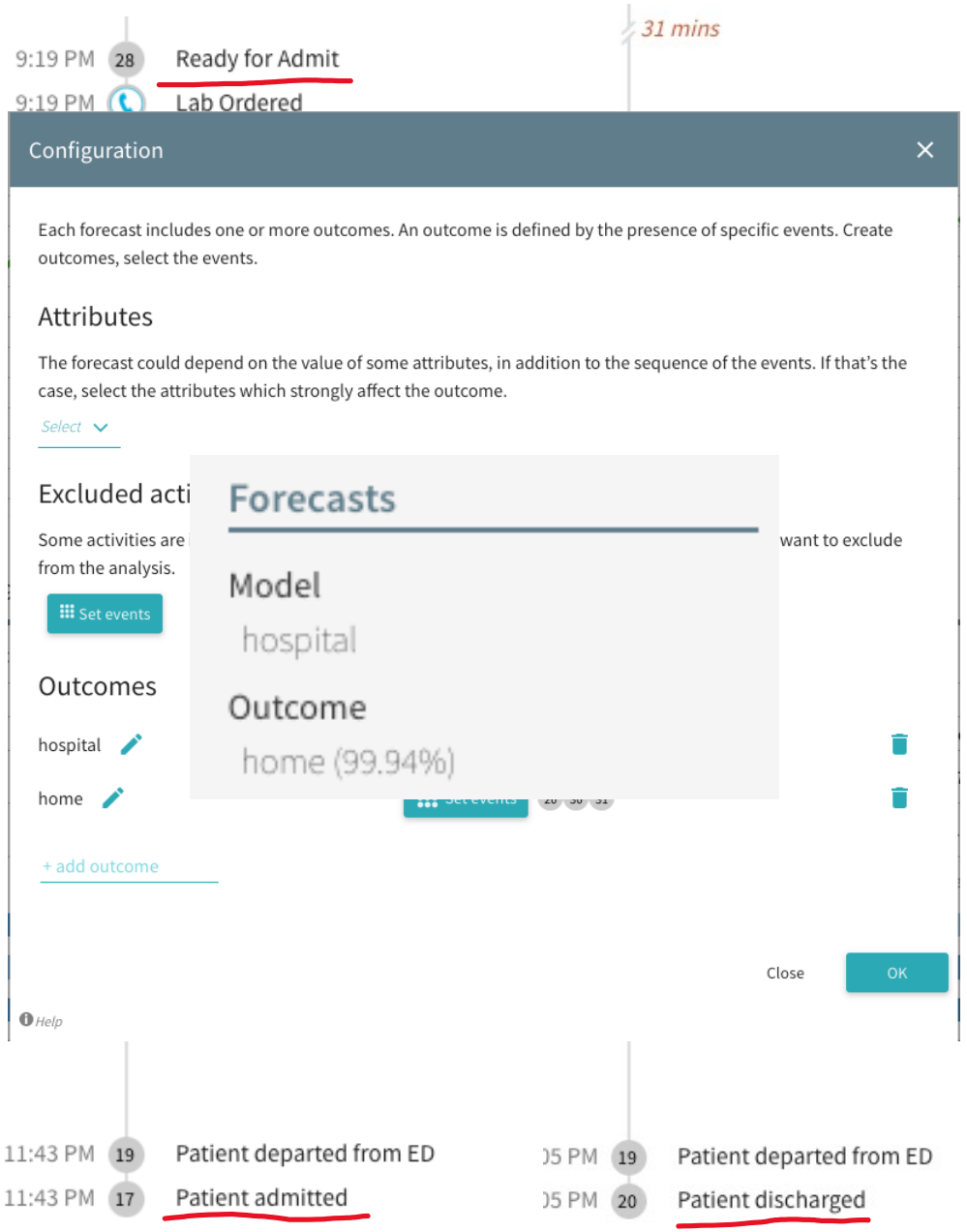


Deadline analysis

Find deadline issues in a process

01 Deadline interval

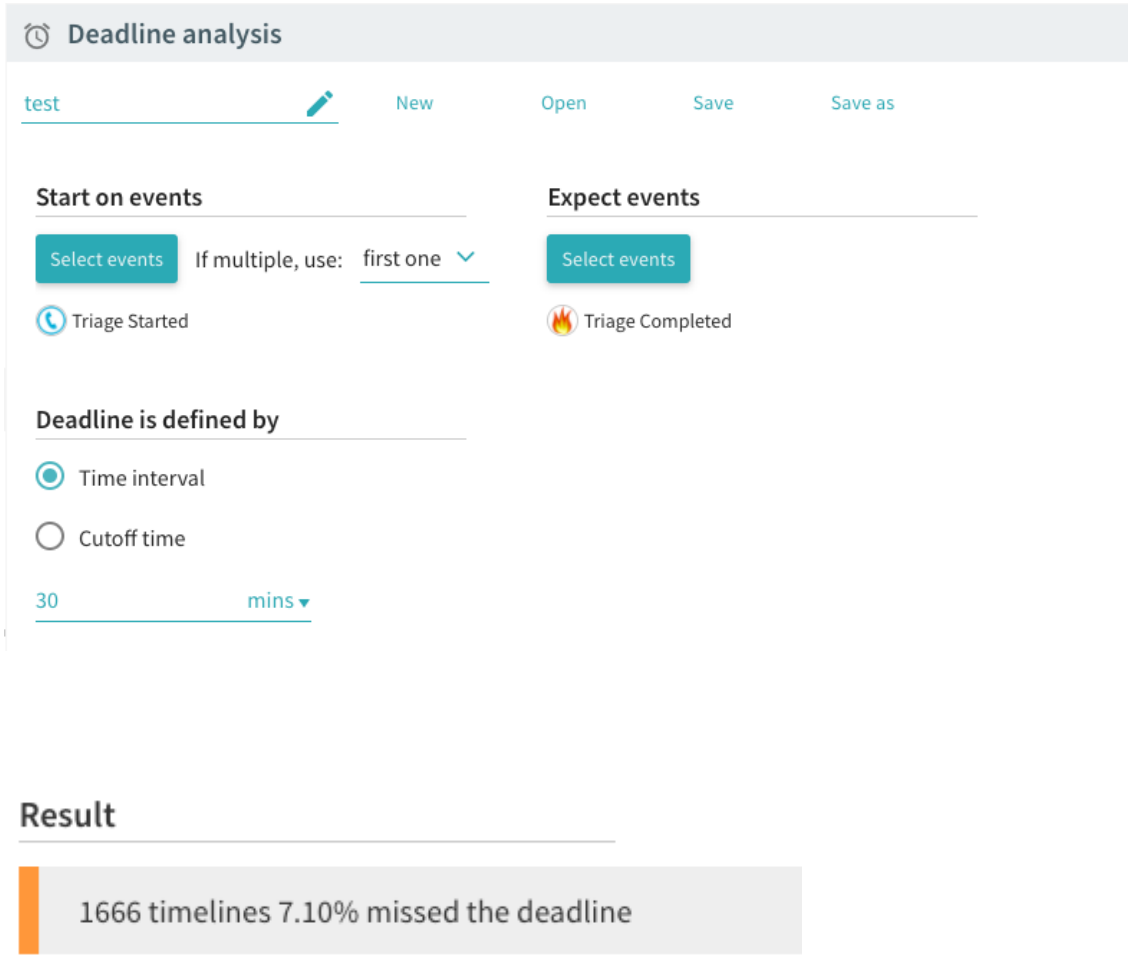
- User selects a set of start and end events
- Provides a time interval

02 Run analysis

- Find timelines where the deadline is missed

03 Filter

- Filter for timelines that miss the deadline



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Deadline prediction

Predict deadline issues in a process

01 Deadline interval

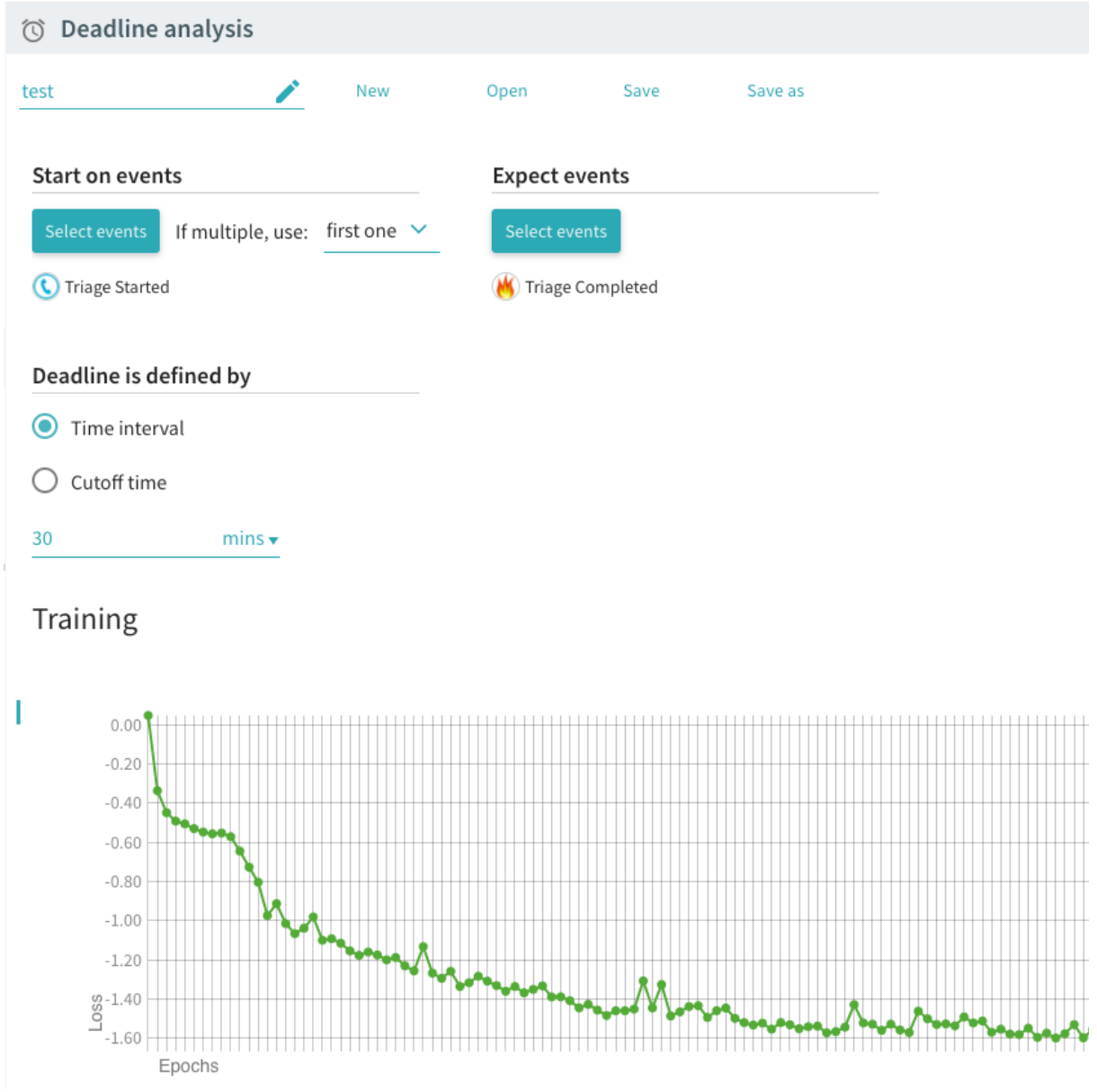
- User selects a set of start and end events
- Provides a time interval

02 Training

- NN inputs:
  - Event sequences
  - Timestamps

03 Prediction

- Based on existing events, predict the distribution of the arrival time of the end event



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Task Mining

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Goals

Analysis, automation

- Fill the gaps in process data (there is a 30 minutes gap, what happened?)
- Robotic Process Automation
- Workforce optimization

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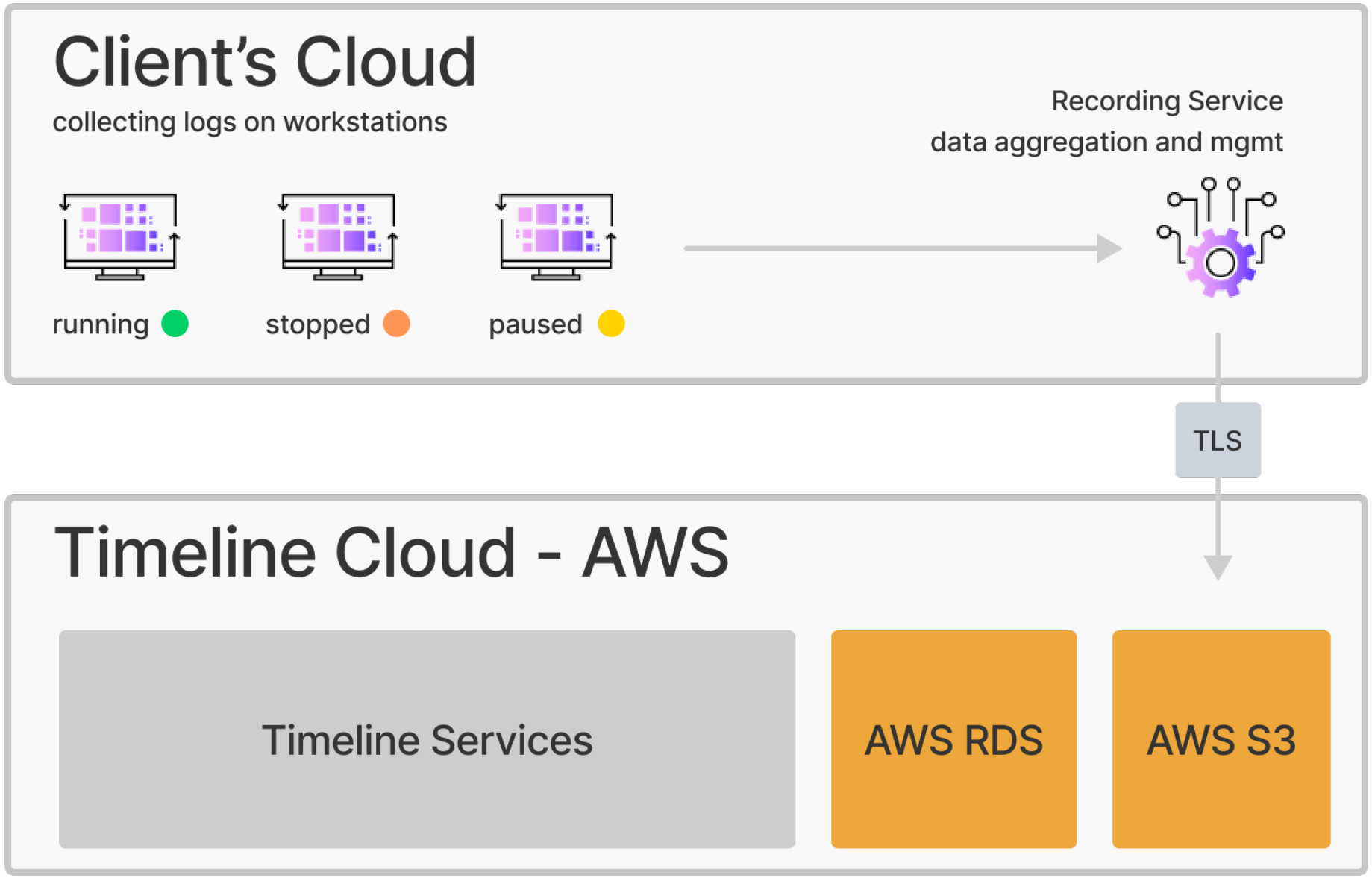
Client's Cloud
collecting logs on workstations
Recording Service
data aggregation and mgmt
running
stopped
paused
TLS
Timeline Cloud - AWS
Timeline Services
AWS RDS
AWS S3

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Task Mining methodology

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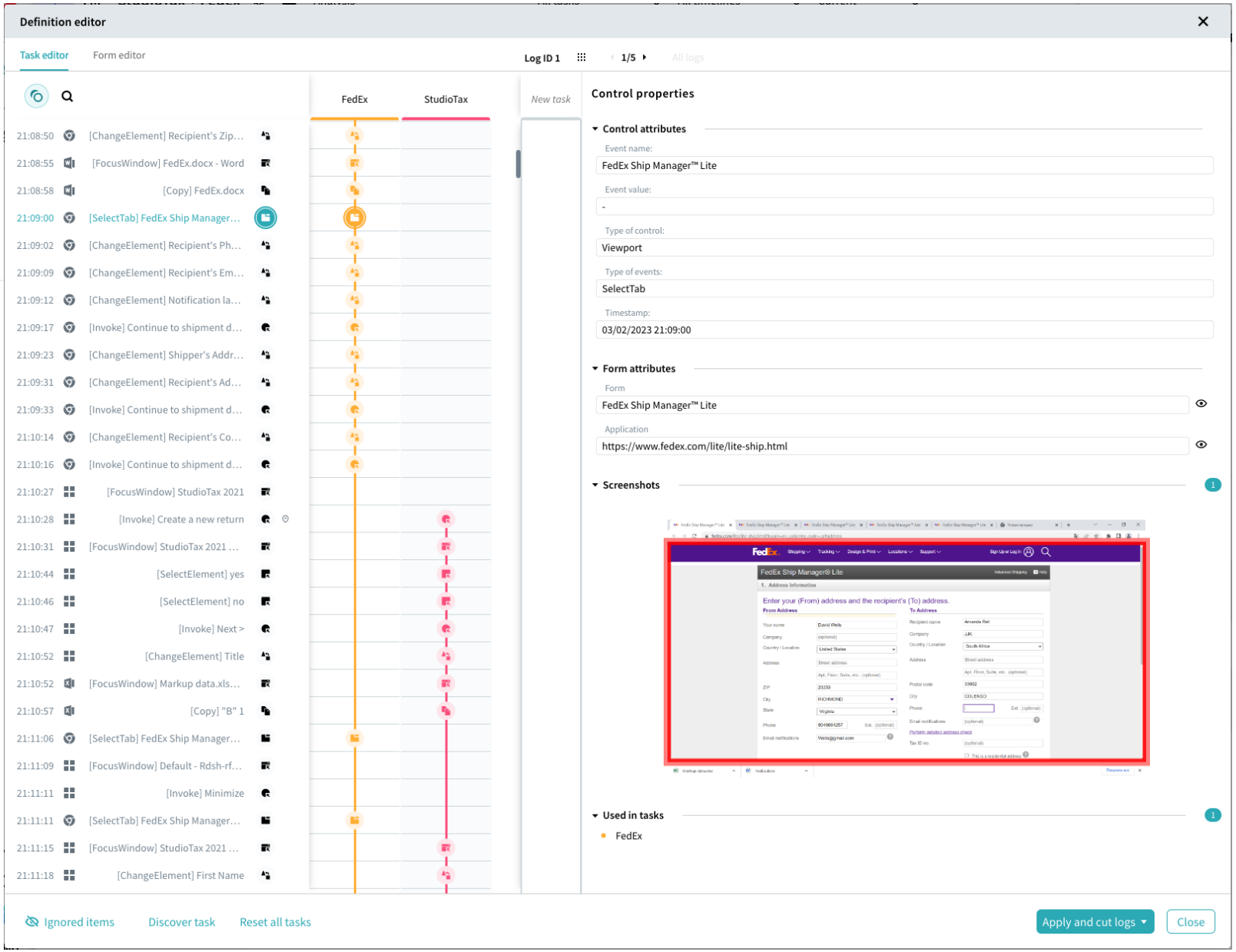
Task Definition

- Find task instances

1. **Start**
   - Form
   - Control
2. **End**
   - Form
   - Control
3. **What's included**
   - Automatic
   - Manual



Tasks

- Overview

1 Automation candidates

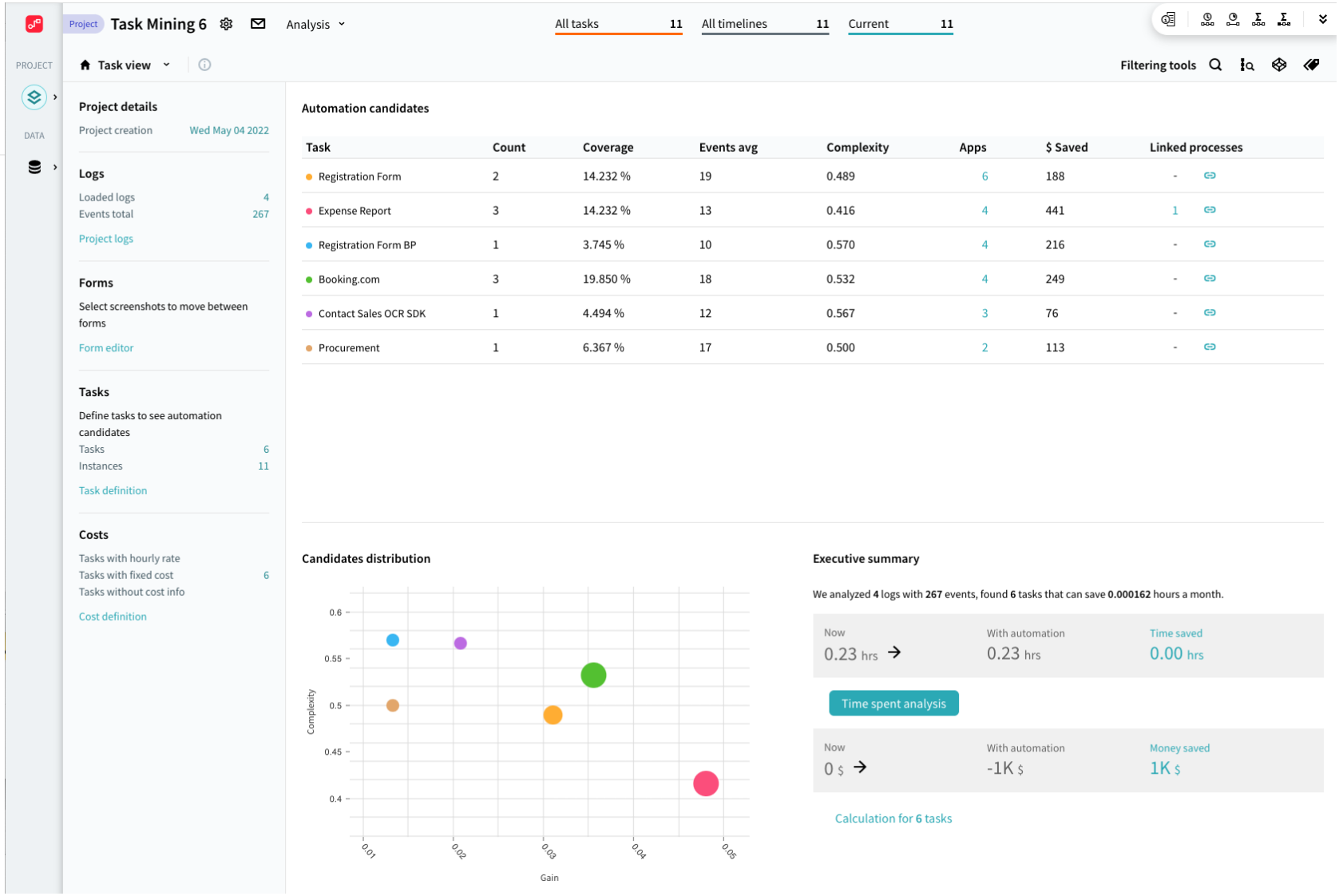
- Cost
- Complexity

2 Candidates distribution

- Complexity
- Gain

3 Executive summary

- Time and money to be saved



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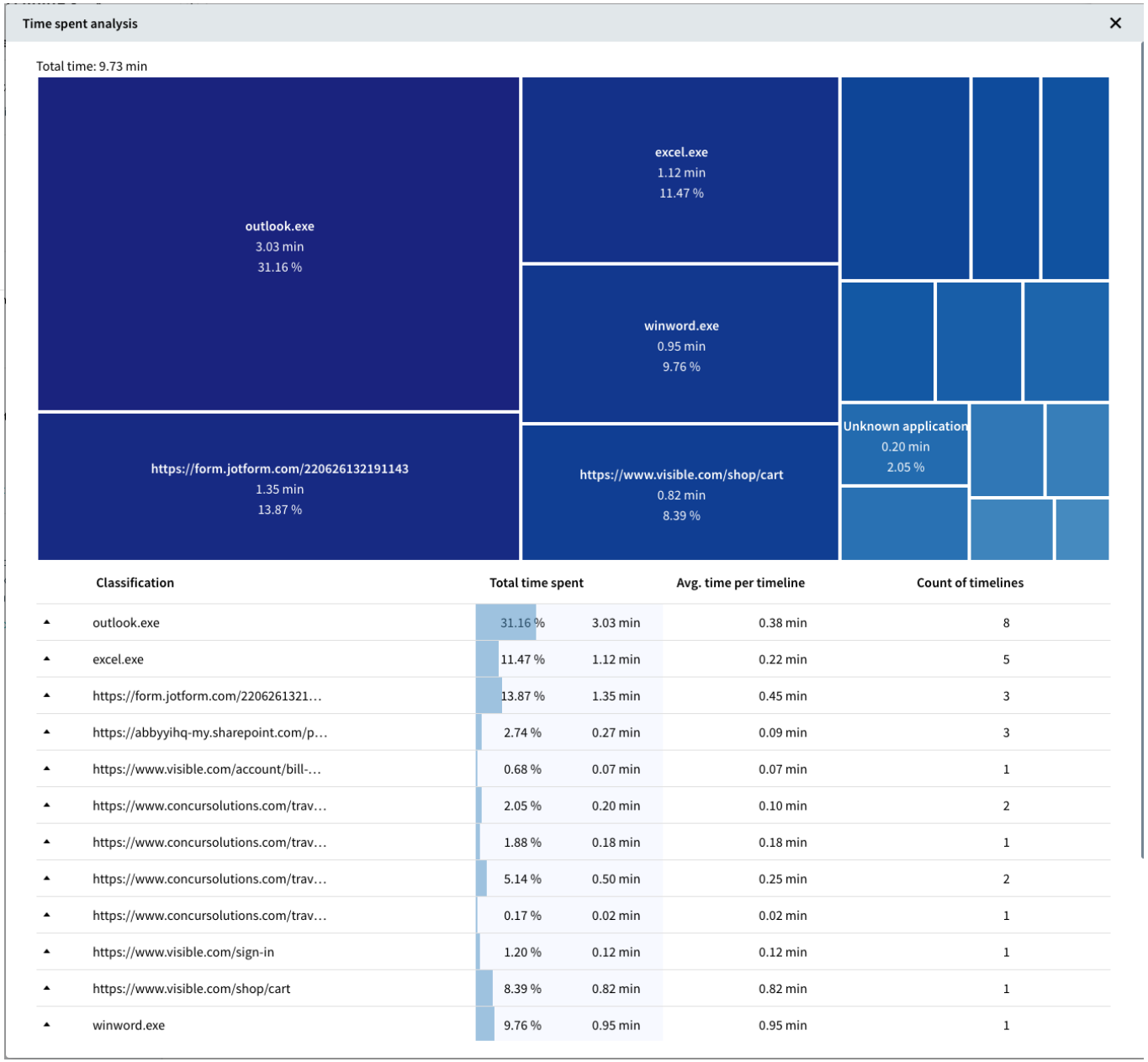
Time-spent analysis

- **Time spent**
  - In apps
  - On forms



Classification	Total time spent		Avg. time per timeline	Count of timelines
outlook.exe	31.16 %	3.03 min	0.38 min	8
excel.exe	11.47 %	1.12 min	0.22 min	5
https://form.jotform.com/2206261321…	13.87 %	1.35 min	0.45 min	3
https://abbyyihq-my.sharepoint.com/p…	2.74 %	0.27 min	0.09 min	3
https://www.visible.com/account/bill-…	0.68 %	0.07 min	0.07 min	1
https://www.concursolutions.com/trav…	2.05 %	0.20 min	0.10 min	2
https://www.concursolutions.com/trav…	1.88 %	0.18 min	0.18 min	1
https://www.concursolutions.com/trav…	5.14 %	0.50 min	0.25 min	2
https://www.concursolutions.com/trav…	0.17 %	0.02 min	0.02 min	1
https://www.visible.com/sign-in	1.20 %	0.12 min	0.12 min	1
https://www.visible.com/shop/cart	8.39 %	0.82 min	0.82 min	1
winword.exe	9.76 %	0.95 min	0.95 min	1

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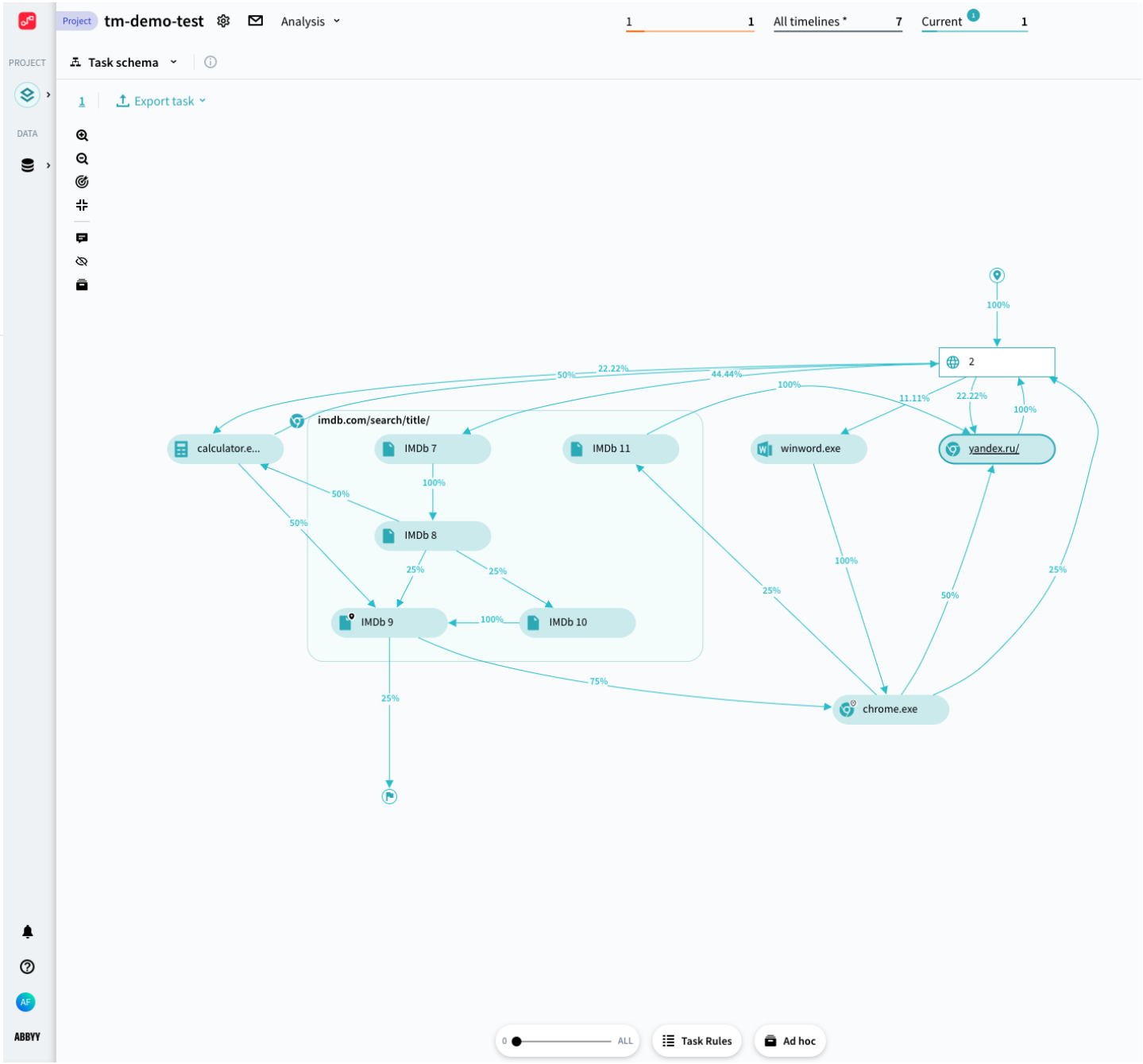
Task schema

- App level
- Form level
- Command level



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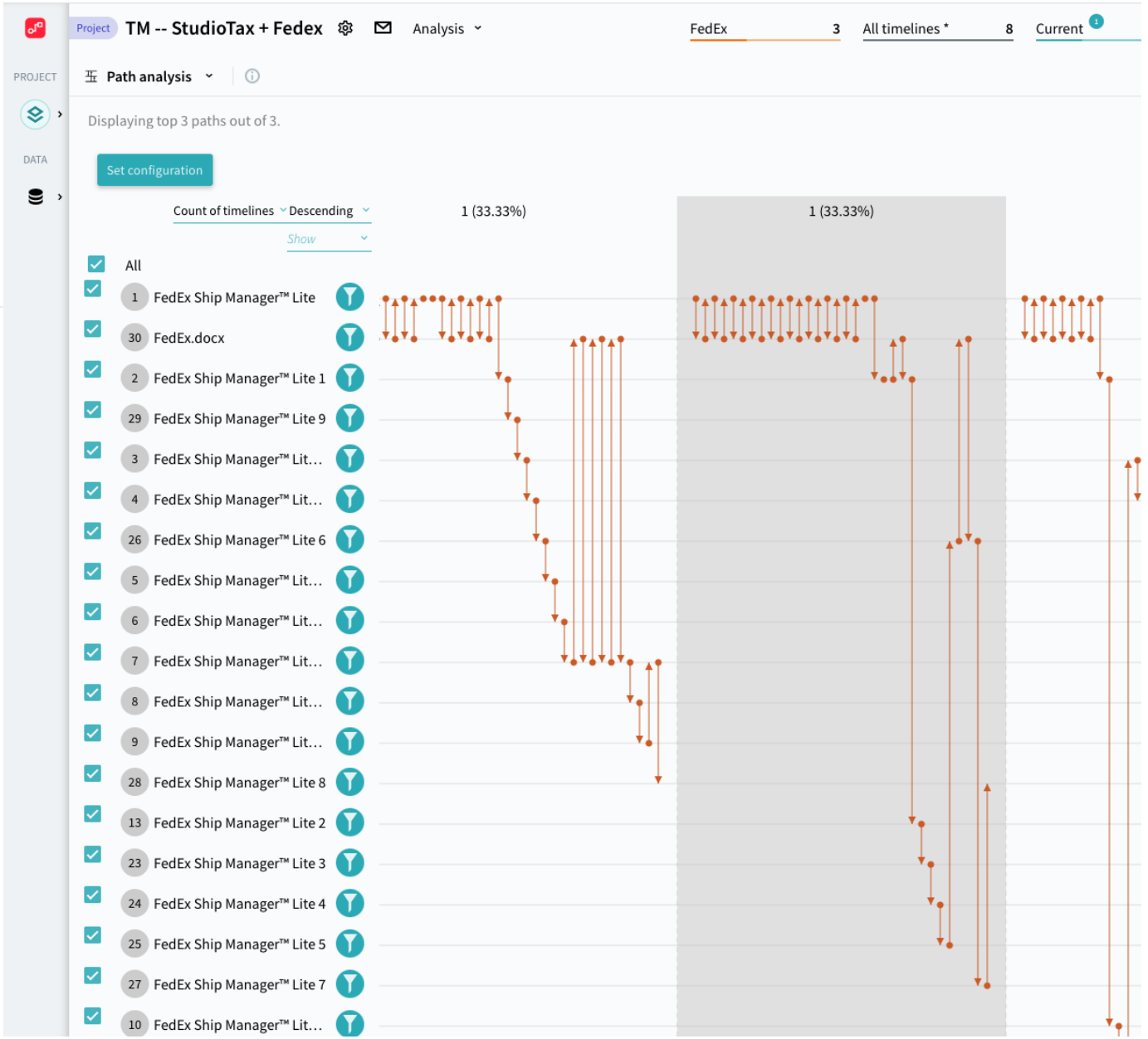
Path analysis

- Iterations between forms



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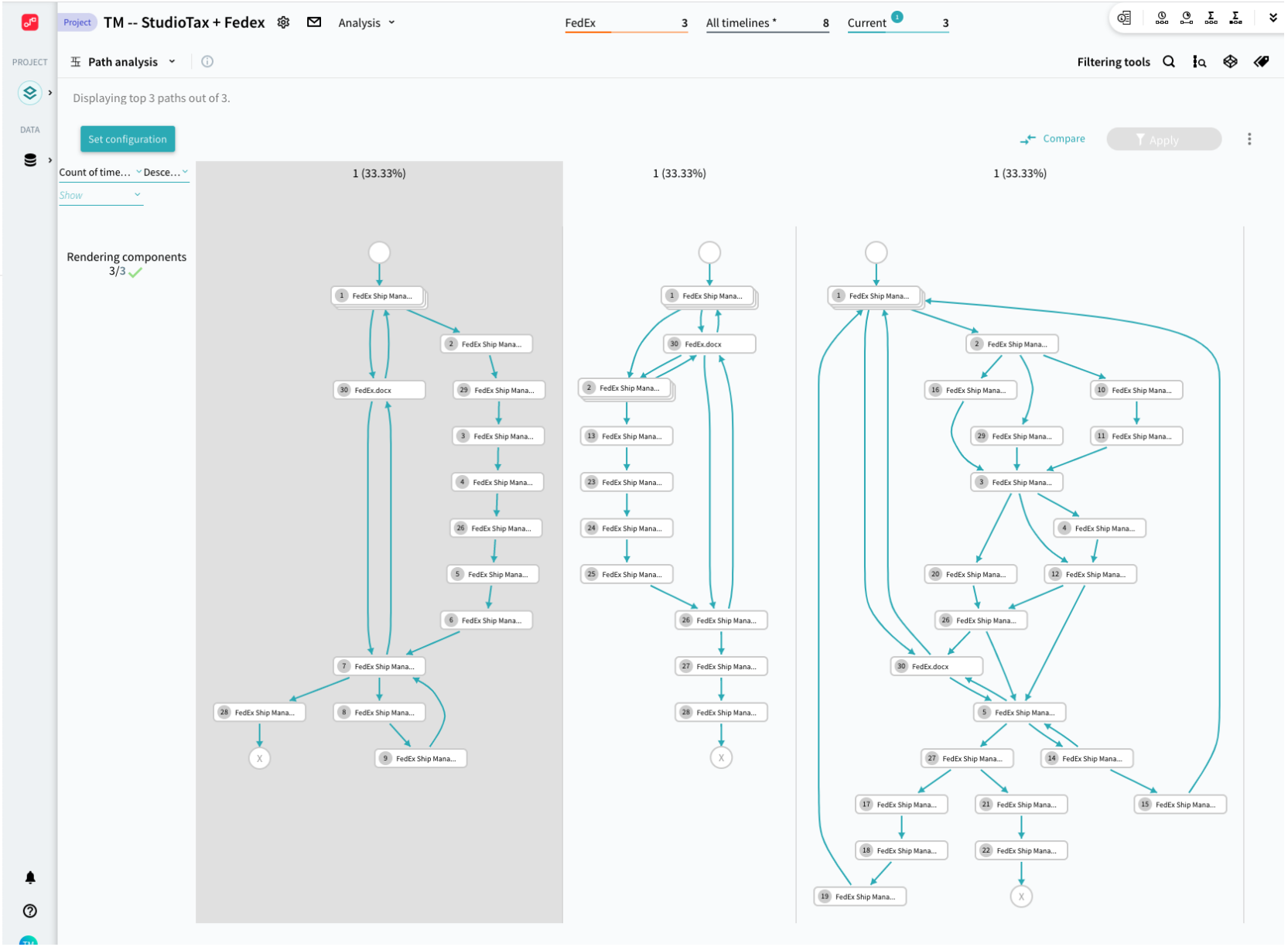
Path analysis

- Schema of different permutations



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RPA

Robotic Process Automation

- Identify the best automation candidate
- Export
    - PDD (Process Definition Document)
    - BluePrism Capture file
    - BPMN -- Chorus BPMN

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Simulation

Goals

What-if analysis

- Help understanding the effect of changes
- Cheap experimentation
    - Change the process
    - Change the timings
    - Change the resources

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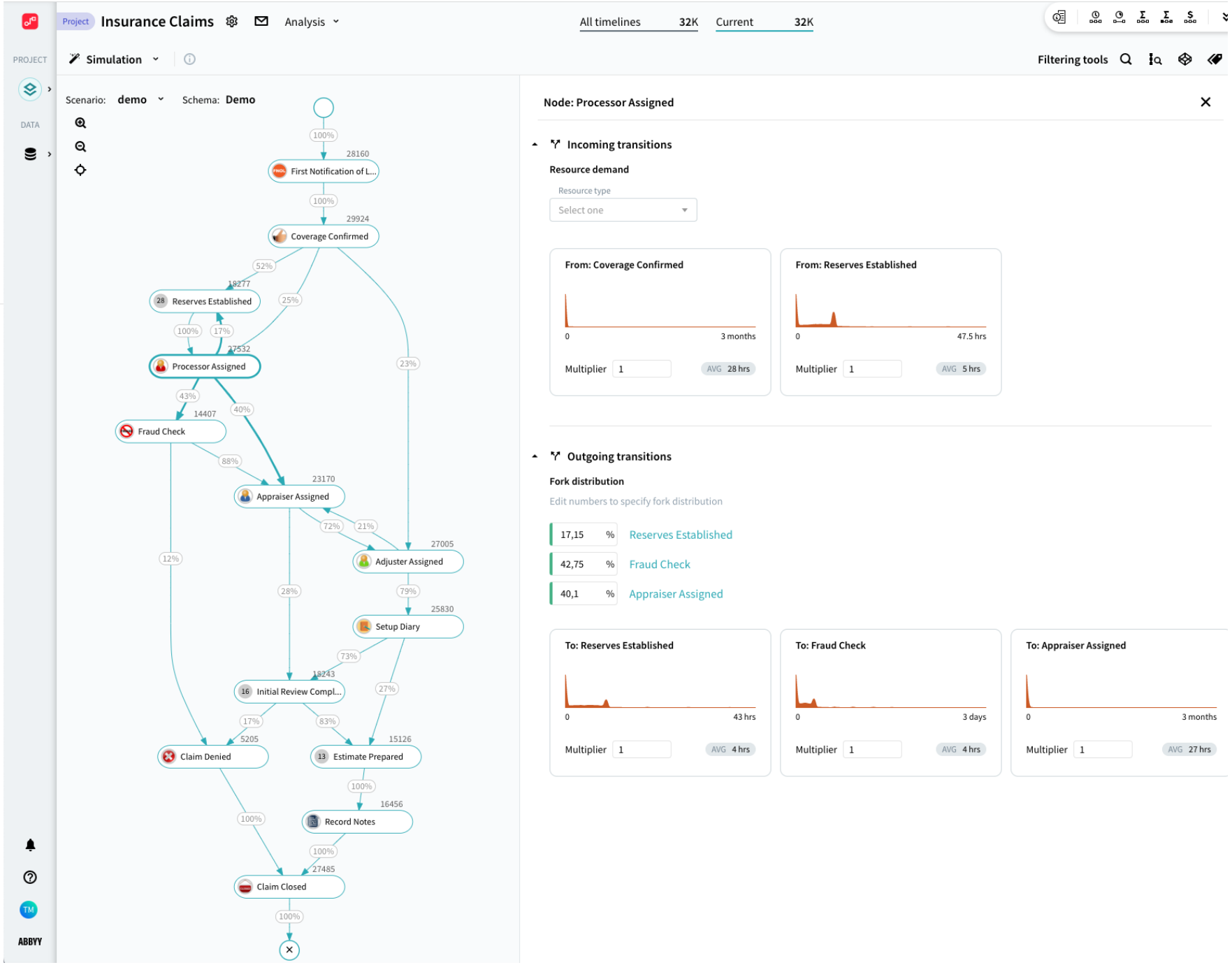
Simulation

- **Behvaior mining**

- Schema
- Forking distribution
- Processing-time distribution
- Arrival-time distribution
- Resources



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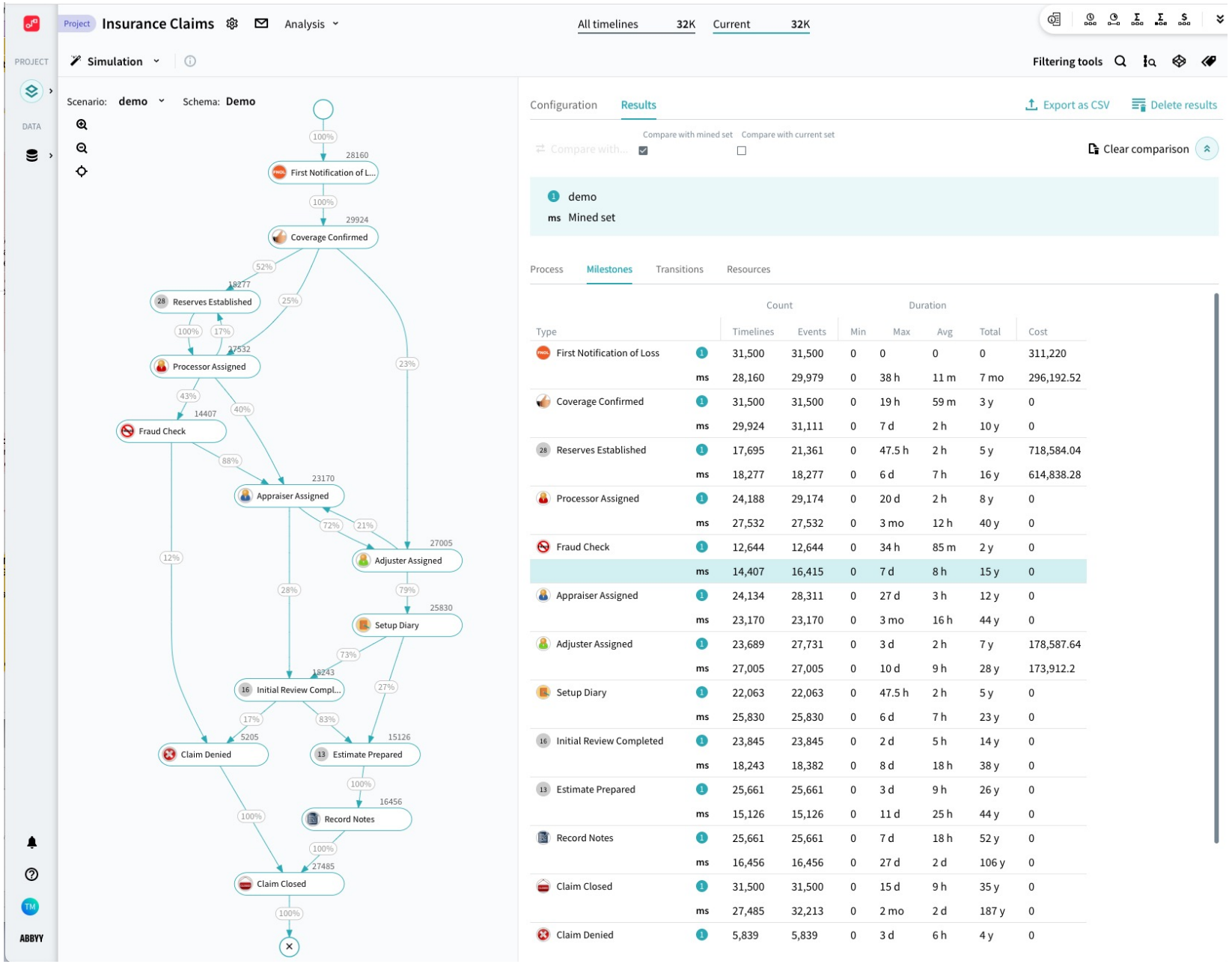
Simulation

- **Results**

  - Simulation results
  - Mined stats
  - Current set stats



Type		Count: Timelines	Count: Events	Duration: Min	Duration: Max	Duration: Avg	Duration: Total	Cost
First Notification of Loss	1	31,500	31,500	0	0	0	0	311,220
	ms	28,160	29,979	0	38 h	11 m	7 mo	296,192.52
Coverage Confirmed	1	31,500	31,500	0	19 h	59 m	3 y	0
	ms	29,924	31,111	0	7 d	2 h	10 y	0
Reserves Established	1	17,695	21,361	0	47.5 h	2 h	5 y	718,584.04
	ms	18,277	18,277	0	6 d	7 h	16 y	614,838.28
Processor Assigned	1	24,188	29,174	0	20 d	2 h	8 y	0
	ms	27,532	27,532	0	3 mo	12 h	40 y	0
Fraud Check	1	12,644	12,644	0	34 h	85 m	2 y	0
	ms	14,407	16,415	0	7 d	8 h	15 y	0
Appraiser Assigned	1	24,134	28,311	0	27 d	3 h	12 y	0
	ms	23,170	23,170	0	3 mo	16 h	44 y	0
Adjuster Assigned	1	23,689	27,731	0	3 d	2 h	7 y	178,587.64
	ms	27,005	27,005	0	10 d	9 h	28 y	173,912.2
Setup Diary	1	22,063	22,063	0	47.5 h	2 h	5 y	0
	ms	25,830	25,830	0	6 d	7 h	23 y	0
Initial Review Completed	1	23,845	23,845	0	2 d	5 h	14 y	0
	ms	18,243	18,382	0	8 d	18 h	38 y	0
Estimate Prepared	1	25,661	25,661	0	3 d	9 h	26 y	0
	ms	15,126	15,126	0	11 d	25 h	44 y	0
Record Notes	1	25,661	25,661	0	7 d	18 h	52 y	0
	ms	16,456	16,456	0	27 d	2 d	106 y	0
Claim Closed	1	31,500	31,500	0	15 d	9 h	35 y	0
	ms	27,485	32,213	0	2 mo	2 d	187 y	0
Claim Denied	1	5,839	5,839	0	3 d	6 h	4 y	0

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Thank you

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November 30, 2023

Software Technology

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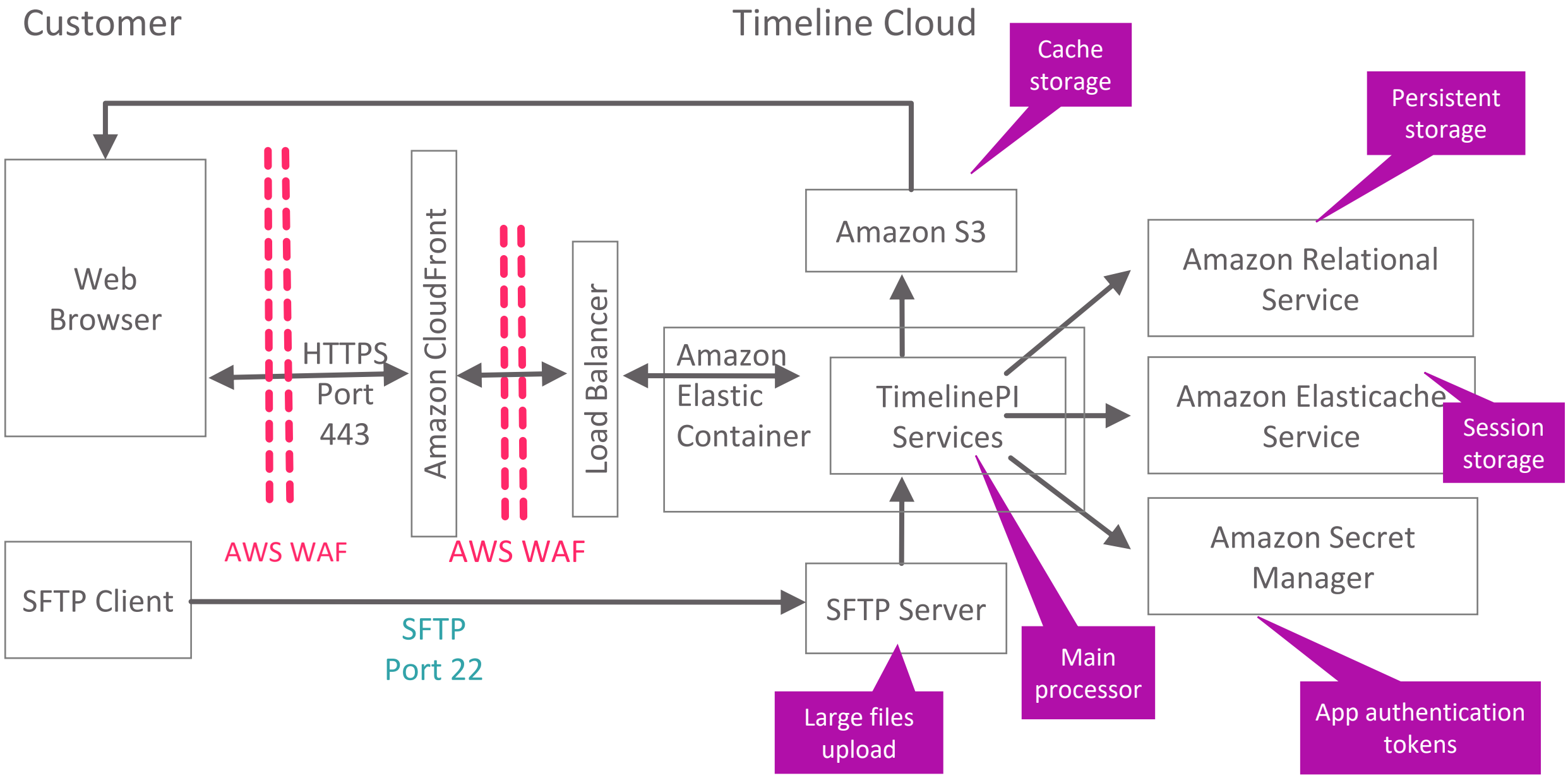
Customer
Timeline Cloud
Cache storage
Persistent storage
Web Browser
HTTPS
Port
443
Amazon CloudFront
Load Balancer
Amazon S3
Amazon Relational Service
Amazon Elastic Container
TimelinePI Services
Amazon Elasticache Service
Session storage
Amazon Secret Manager
AWS WAF
AWS WAF
SFTP Client
SFTP
Port 22
SFTP Server
Main processor
Large files upload
App authentication tokens

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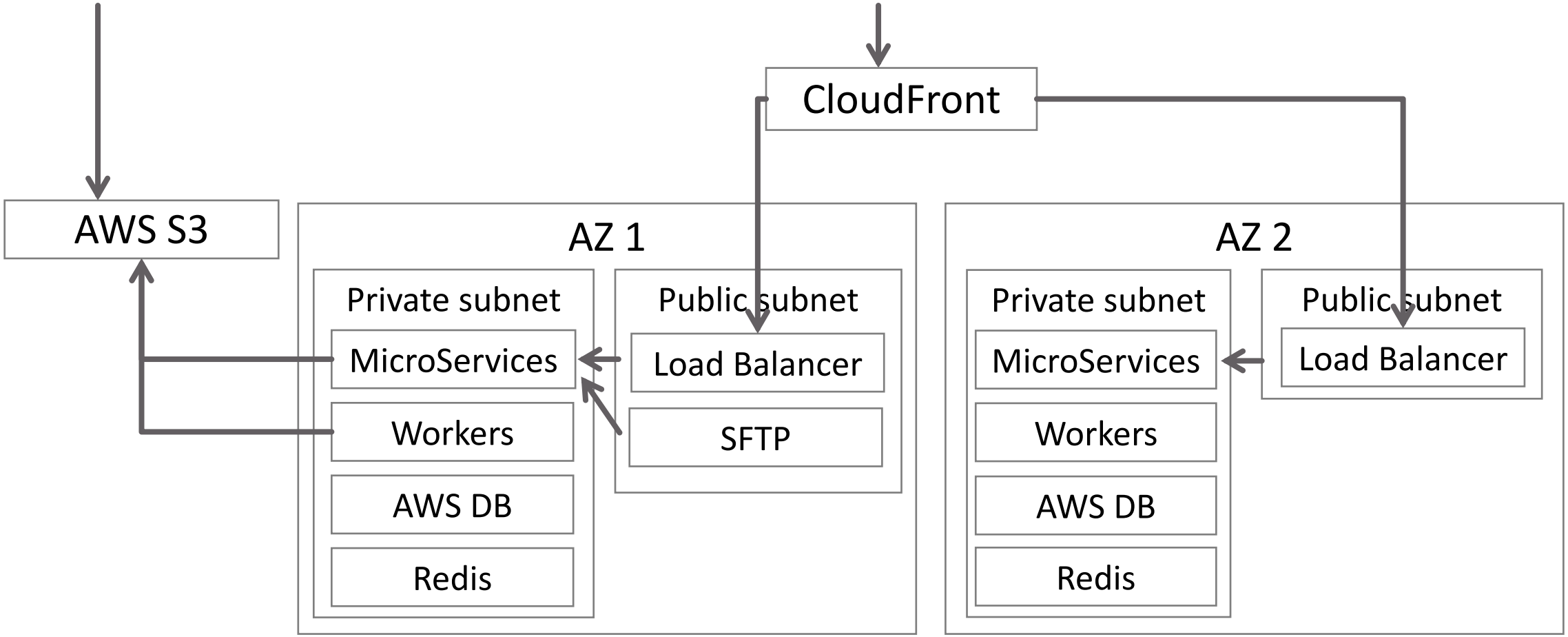
CloudFront
AWS S3
AZ 1
Private subnet
MicroServices
Workers
AWS DB
Redis
Public subnet
Load Balancer
SFTP
AZ 2
Private subnet
MicroServices
Workers
AWS DB
Redis
Public subnet
Load Balancer

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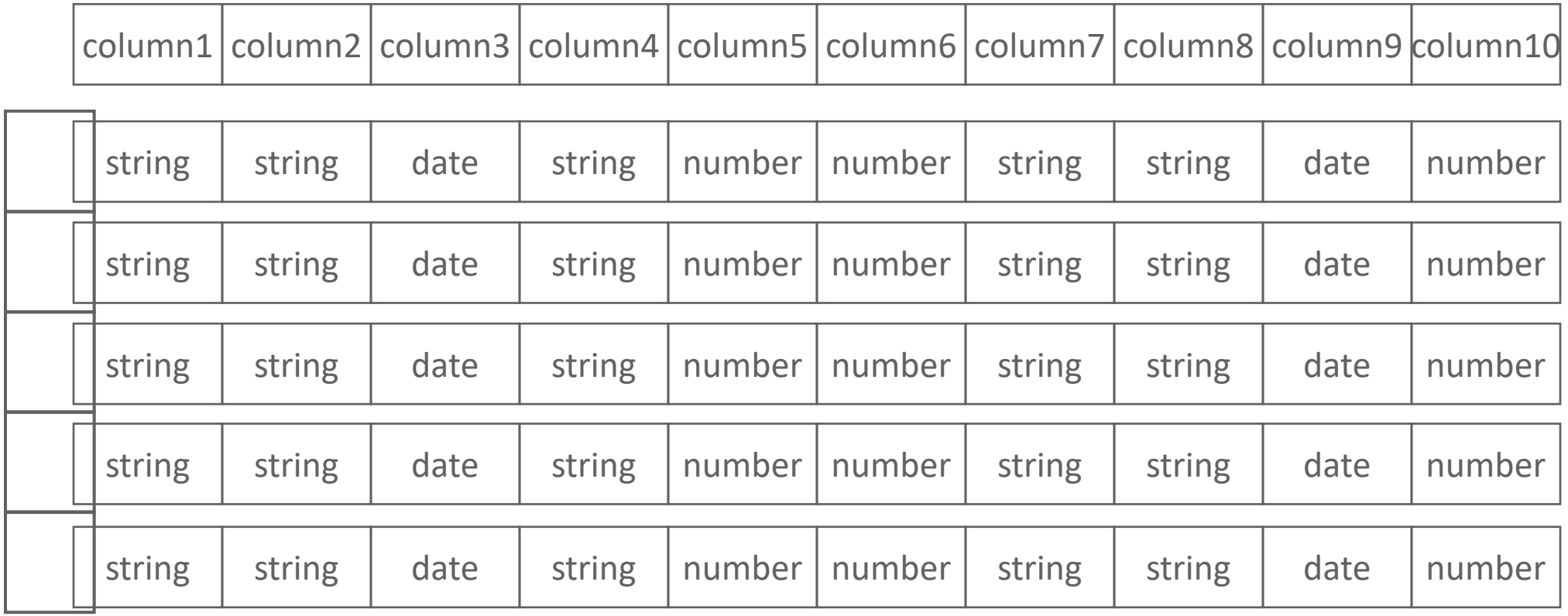
Timelines in Memory

Array of arrays



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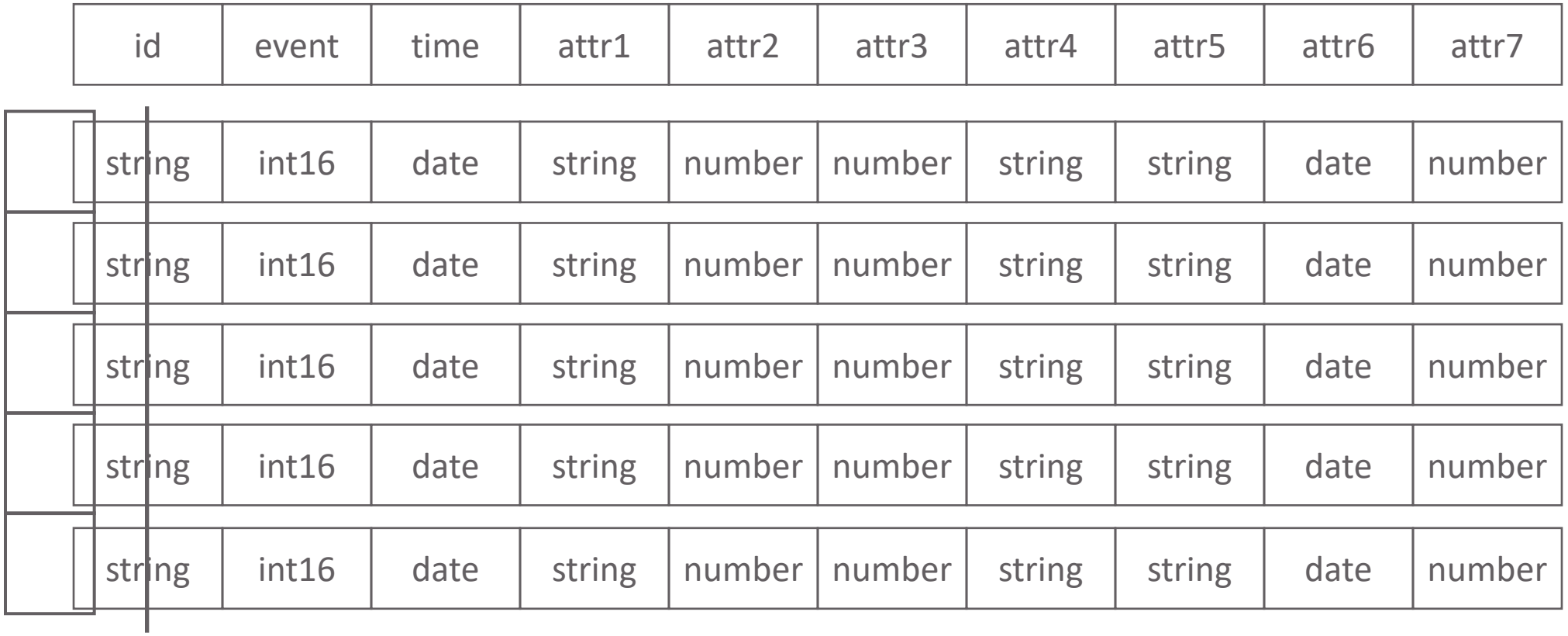
Timelines in Memory

Arrays of events



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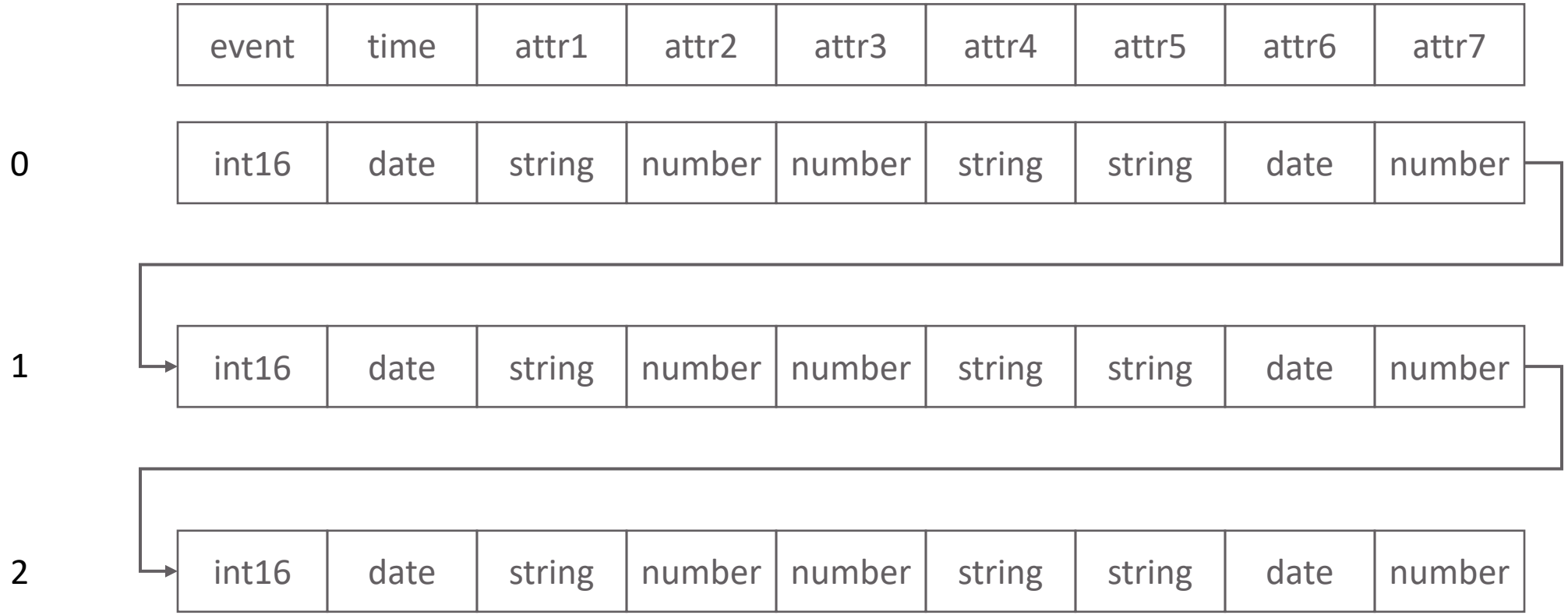
Timelines in Memory

Array of events



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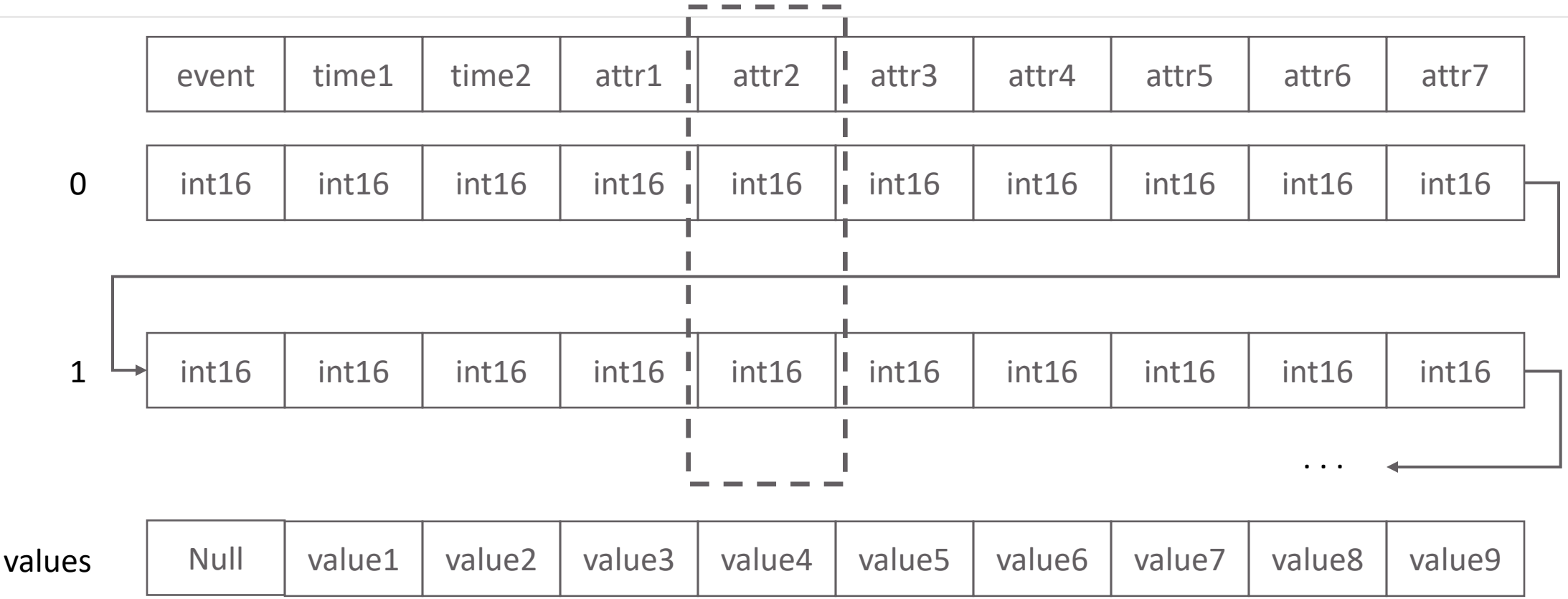
Timelines in Memory

ByteArray + values



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Columnar format

Store each column as a separate byte array

01 Timeline index

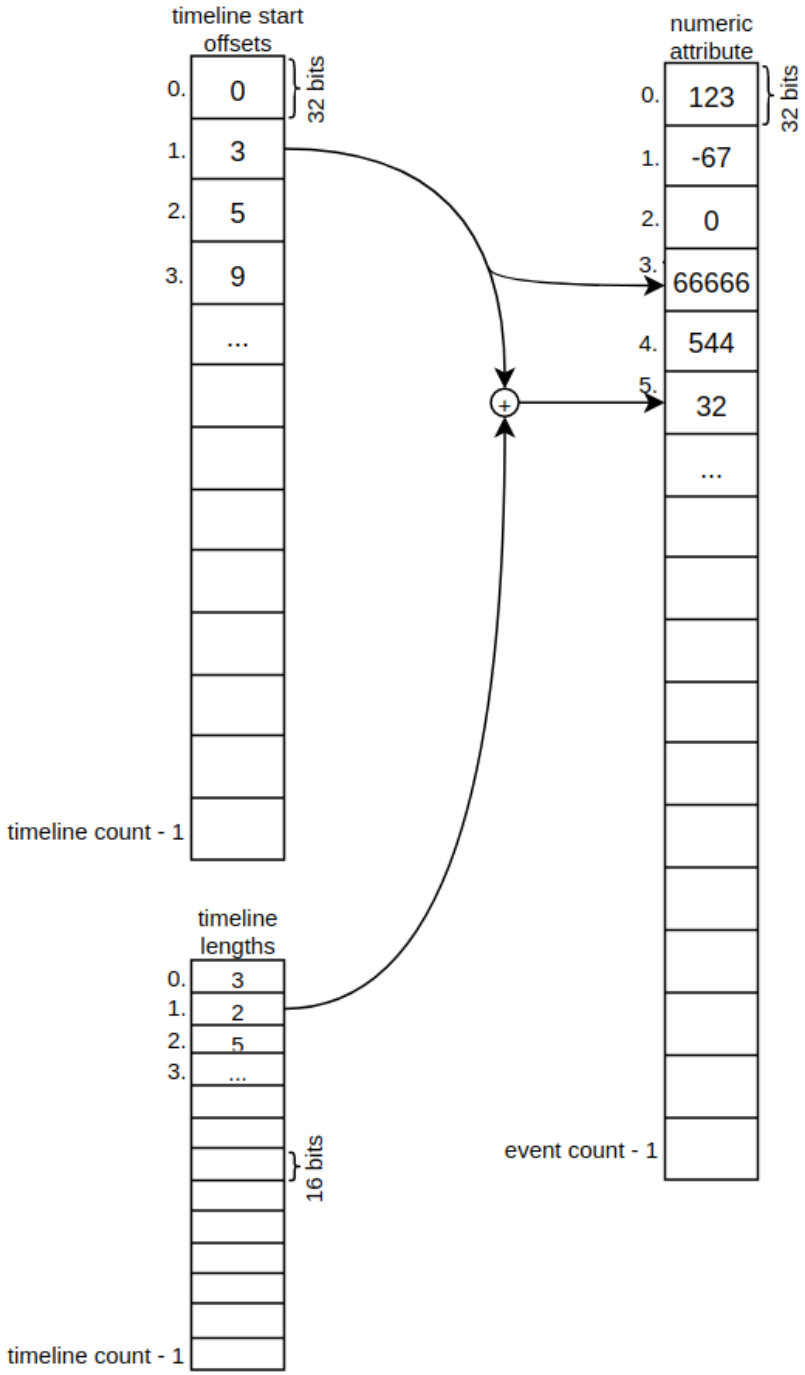
- Timeline start indexes
- Timeline lengths

02 Attribute column

- Use the number of bytes enough to store all values

03 Null values

- Use a separate byte array as Boolean flags



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Categorical values

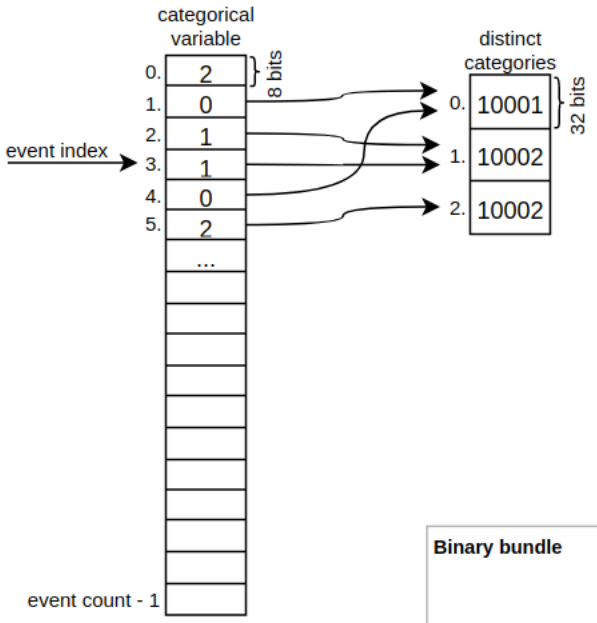
Use separate value arrays to store categorical and string values

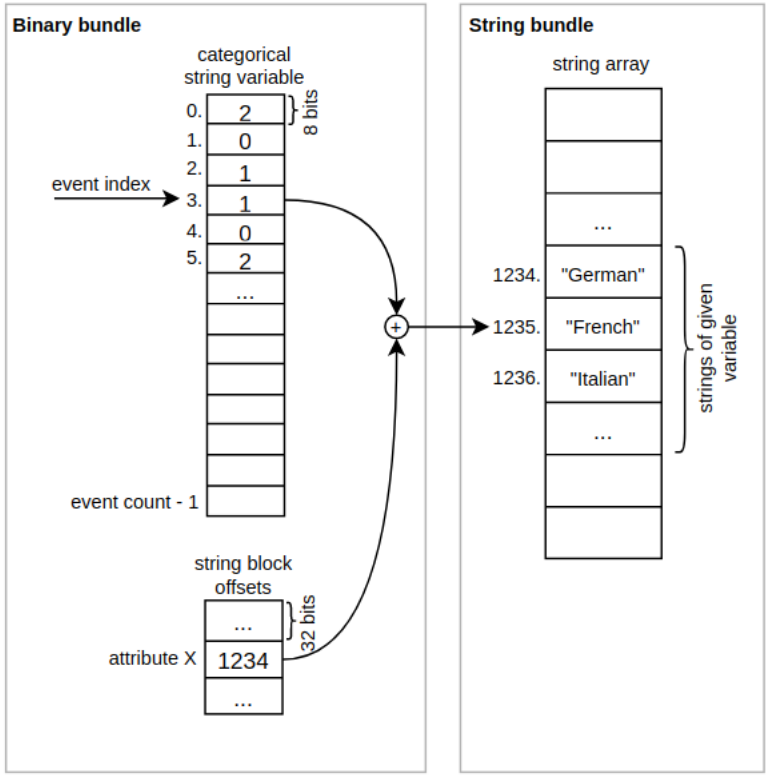
01 Categorical numbers

- Short byte array of long values
- Long byte array of short values

02 String columns

- One long string array partitioned by columns
- Byte array with appropriate long elements
- Offset array to show the start of attribute X in the string array





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