IBM Cloud Pak for Business Automation Demos and Labs 2021

IBM Process Mining

Use Process Mining to Create and Explore Process Models

V 3.1

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Latest version: https://ibm.box.com/v/ProcessMiningLab1

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1 Lab Setup

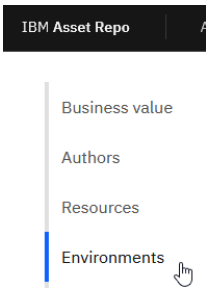
1.1 Reserve IBM Asset Repo Process Mining Asset

If you have already reserved Process Mining Environment on IBM Asset Repo, you can skip this step.

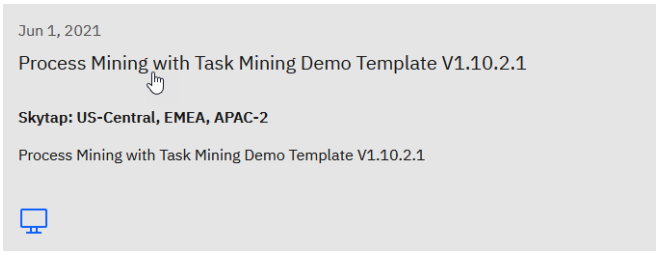
_1. Navigate to https://assetrepo.ibm.com/collection/60afd1b2bd0c01001f47acb1

Note, you may be asked to sign in with you IBM ID. In this case, after you sign in, click the above link again to enter the *Process Mining with Task Mining Demo Template V1.10.2.1* page.

_2. Click **Environments**

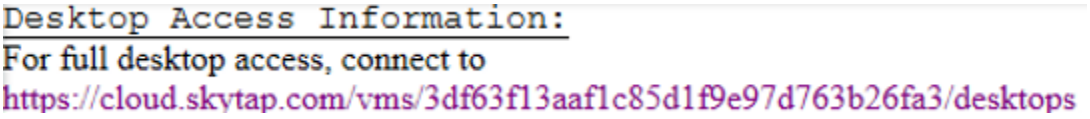


_3. Click **Process Mining with Task Mining Demo Template V1.10.2.1**



_4. Create a reservation.

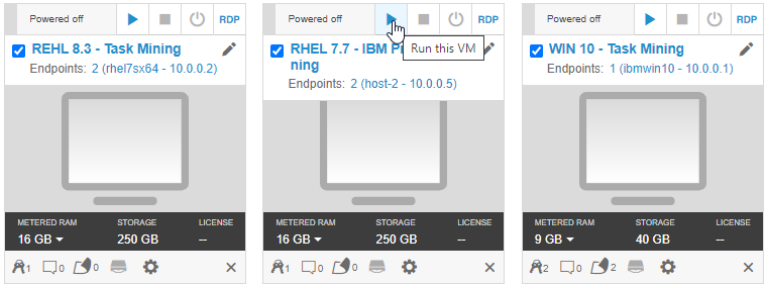
When you receive "Your IBM Demonstration is Ready!" email, click the desktop asset information link included in the email.



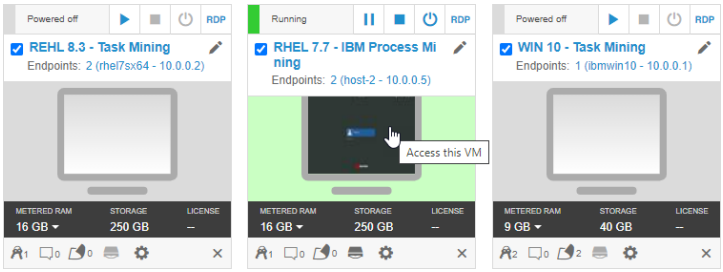
1.2 Start IBM Process Mining VM

If you have started IBM Process Mining VM, you can skip this step.

_1. On *RHEL 7.7 – IBM Process Mining* click **Run tis VM** button



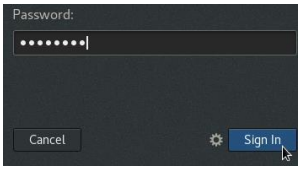
_2. When the VM is Running, click **Access this VM**



_3. Click **Not listed?**

_4. For *Username* enter root and click **Next**

_5. For *Password* enter passw0rd and click **Sign In**



1.3 Start IBM Process Mining Server

If you have started IBM Process Mining Server, you can skip this step.

_1. On the desktop double-click **Terminal**

_2. In Terminal window enter **cd /opt/processmining/bin**

_3. Enter **./start.sh**

_4. Enter **sudo fuser -k 80/tcp**

_5. Enter **service nginx start**

_6. Enter **./start.sh**

You should see output like this:

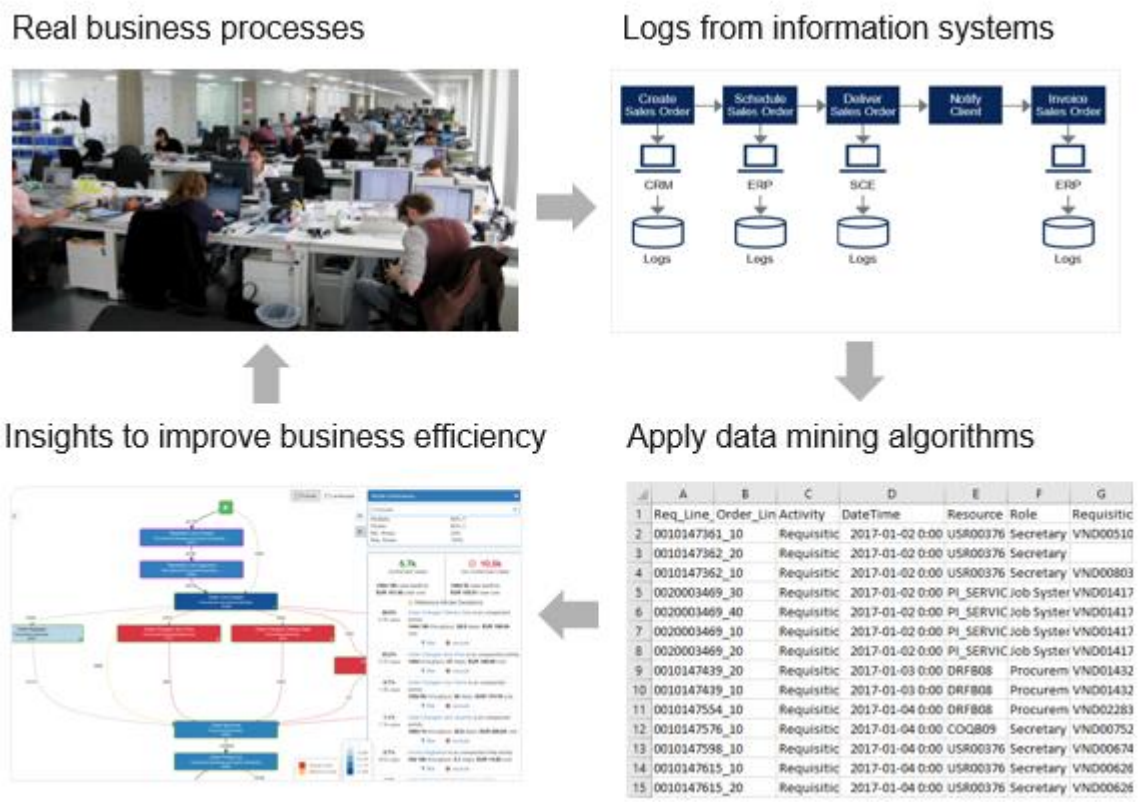
```
[root@client ~]# cd /opt/processmining/bin
[root@client bin]# ./start.sh
Using tmp: /opt/processmining/repository/temp
Starting Jetty: 2021-05-27 08:34:24.184:INFO::main: Logging initialized @1475ms to org.eclipse.jetty.util.log.StdErrLog
2021-05-27 08:34:24.363:WARN:oejx.XmlConfiguration:main: Property 'jetty.secure.port' is deprecated, use 'jetty.httpConf
ig.securePort' instead
2021-05-27 08:34:24.574:INFO::main: Console stderr/stdout captured to /opt/processmining/jetty-web/logs/2021_05_27.jetty
.log
OK Thu May 27 08:34:26 PDT 2021
Using tmp: /opt/processmining/repository/temp
JETTY_ARGS: jetty.host=127.0.0.1 jetty.port=8070 jetty.ssl.port=7443
Starting Jetty: 2021-05-27 08:34:28.684:INFO::main: Logging initialized @1950ms to org.eclipse.jetty.util.log.StdErrLog
2021-05-27 08:34:28.873:INFO::main: Console stderr/stdout captured to /opt/processmining/jetty-engine/logs/2021_05_27.je
tty.log
OK Thu May 27 08:34:30 PDT 2021
Using tmp: /opt/processmining/repository/temp
JETTY_ARGS: jetty.host=127.0.0.1 jetty.port=9070 jetty.ssl.port=9071
Starting Jetty: 2021-05-27 08:34:32.217:INFO::main: Logging initialized @1304ms to org.eclipse.jetty.util.log.StdErrLog
2021-05-27 08:34:32.422:INFO::main: Console stderr/stdout captured to /opt/processmining/jetty-analytics/logs/2021_05_27
.jetty.log
OK Thu May 27 08:34:34 PDT 2021
[root@client bin]# sudo fuser -k 80/tcp
80/tcp:              1862
[root@client bin]# service nginx start
Redirecting to /bin/systemctl start nginx.service
[root@client bin]#
```

_7. **Close** the Terminal Window

2 Introduction

2.1 About Process Mining

Process mining is a family of techniques in the field of process management that support the analysis of real business processes based on event logs. During process mining, specialized data mining algorithms are applied to identify trends, patterns, and details contained in event logs recorded by an information system. Process mining aims to improve process efficiency and understanding of processes.



	A	B	C	D	E	F	G
1	Req_Line_	Order_Lin	Activity	DateTime	Resource	Role	Requisitic
2	0010147361_10		Requisitic	2017-01-02 0:00	USR00376	Secretary	VND00510
3	0010147362_20		Requisitic	2017-01-02 0:00	USR00376	Secretary	
4	0010147362_10		Requisitic	2017-01-02 0:00	USR00376	Secretary	VND00803
5	0020003469_30		Requisitic	2017-01-02 0:00	PI_SERVIC	Job Syster	VND01417
6	0020003469_40		Requisitic	2017-01-02 0:00	PI_SERVIC	Job Syster	VND01417
7	0020003469_10		Requisitic	2017-01-02 0:00	PI_SERVIC	Job Syster	VND01417
8	0020003469_20		Requisitic	2017-01-02 0:00	PI_SERVIC	Job Syster	VND01417
9	0010147439_20		Requisitic	2017-01-03 0:00	DRFB08	Procurem	VND01432
10	0010147439_10		Requisitic	2017-01-03 0:00	DRFB08	Procurem	VND01432
11	0010147554_10		Requisitic	2017-01-04 0:00	DRFB08	Procurem	VND02283
12	0010147576_10		Requisitic	2017-01-04 0:00	COQB09	Secretary	VND00752
13	0010147598_10		Requisitic	2017-01-04 0:00	USR00376	Secretary	VND00674
14	0010147615_10		Requisitic	2017-01-04 0:00	USR00376	Secretary	VND00626
15	0010147615_20		Requisitic	2017-01-04 0:00	USR00376	Secretary	VND00626

2.2 About this lab

In this lab you will learn the basics of IBM Process Mining tools. Specifically you will:

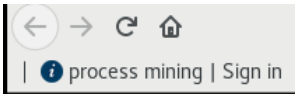
- learn how to create a process from mined process data,
- get a high-level introduction of key process mining features and their value.

3 Lab Instructions

3.1 Open IBM Process Mining Application

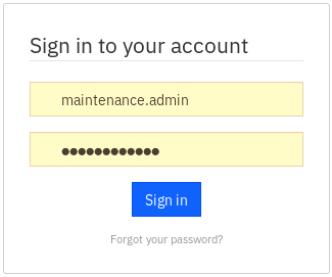
_1. On the Linux desktop double-click **Firefox**

_2. If you do not see the login page, click on **process mining | Sign in**



> Note: if you get an error, please wait for few minutes for the IBM Process Mining runtime to start and try again.
>
> Unable to connect

_3. For *user type* **maintenance.admin** and for *password* enter **TM/admin1** and click **Sign in**



3.2 Open Pre-Built Order Processing Process

If you are interested in learning how to create and configure processes from mined data, skip this section and go directly to Create New Process from Logs section.

If you just want to go straight into exploration of process mining features, continue with the steps below:

_1. Click **Order Processing** box

This will open a pre-created Order Processing process. For the Order Processing example, the event log file has already been loaded, and the process visualization already exists, so you will see the process model.

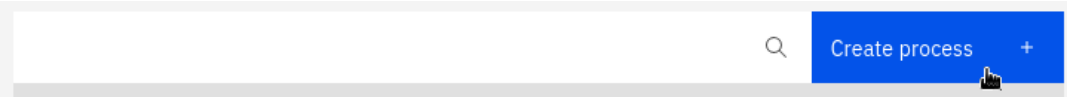
_2. Go to Explore the Process Model section, and explore how to study the process model.

4 Create New Process from Logs

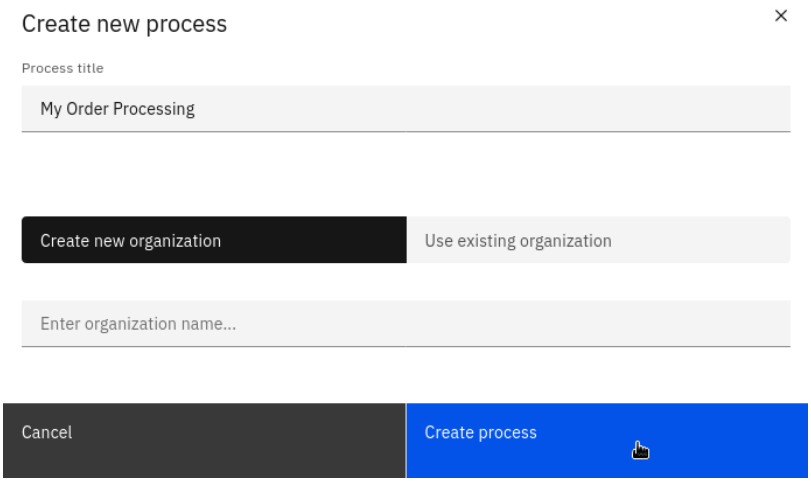
4.1 Create a New Process

When you open a workspace you can create and a Process and Organization or a New Process in an Exiting Organization (in our case you should see, and an organization called Tutorials).

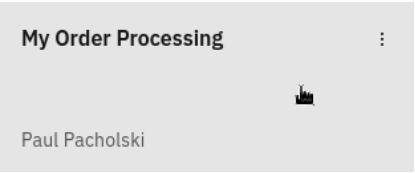
_1. Click in **Create process** +



_2. For *Process Title* enter **My Order Processing** and click **Create process**



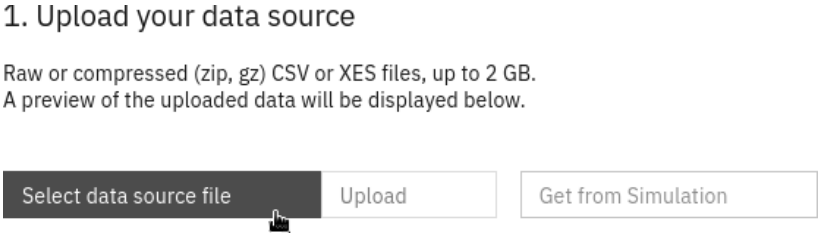
_3. Click **My Order Processing**



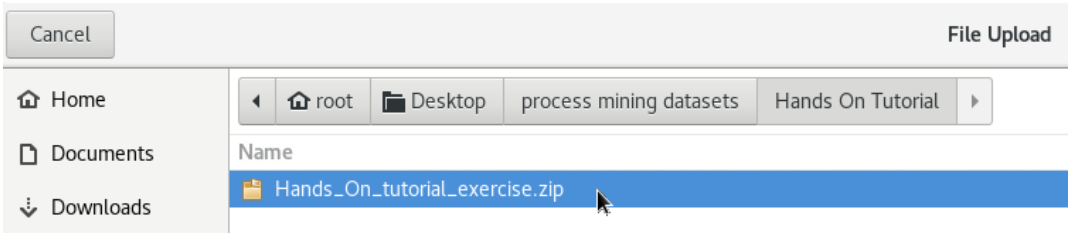
4.2 Upload Process data

To analyze the process, you will need to upload a log file (.CSV or .XES) containing mined process data into the Data Source.

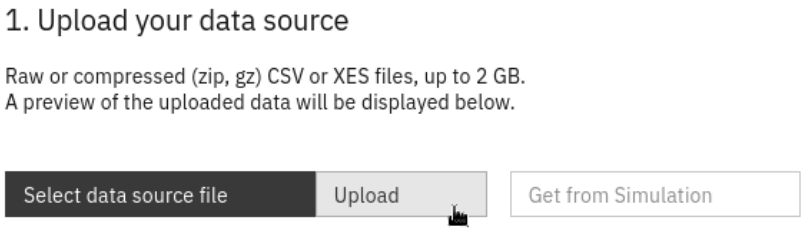
_1. Click **Select data source file** to upload a CSV data which was captured from an existing Oder Processing process



_2. Navigate to **root > Desktop > process mining data sets > Hands On Tutorial**, select **Hands_On_tutorial_excercise.zip** then click **Open**



_3. Click **Upload**



4.3 Map data columns to predefined fields

After uploading the log file, you will need to identify data columns in your log file and map them to fields used by process mining algorithms:

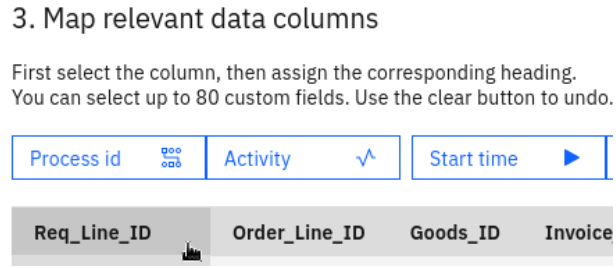
- System Data : Process ID, Activity, Start time, End Time, Resource and Role
- Business Data: up to 80 Custom Fields

To be able to visualize your process, it is mandatory to map:

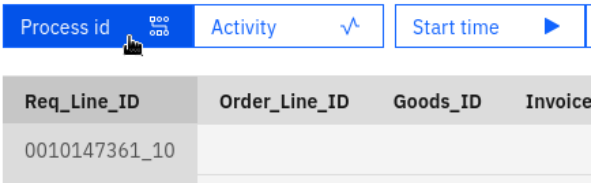
- at least one process id,
- the activity field and
- a datetime field (as start time)

4.3.1 Map Columns to Process ID

_1. Select **Req_Line_ID** column



_2. Click **Process ID** button top complete the mapping



Note the icon and number 1 appearing on the data column heading to indicate that mapping is now in effect.

_3. Repeat the above two steps to map **Order_Line_ID**, **Goods_ID** and **Invoice_ID** columns to **Process ID**.

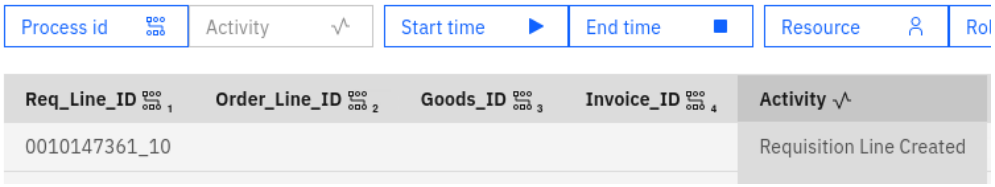
Your columns headings should look like this:

4.3.2 Map Column to Activity

_1. Select **Activity** column

_2. Click **Activity** button to complete the mapping

You should now see the activity icon on the Activity column



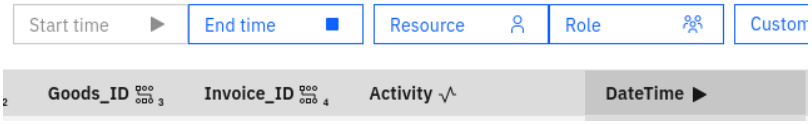
4.3.3 Map Column to Start time

_1. Select **DateTime** column

_2. Click **Start time** button to complete the mapping

_3. On Field mapping click **OK**

You should now see the right arrow icon on the DateTime column



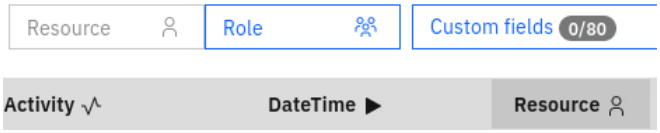
4.3.4 Map Column to Resource

_1. Select **Resource** column

_2. Click **Resource** button to complete the mapping

_3. On Field mapping click **OK**

You should now see the person icon on the Resource column



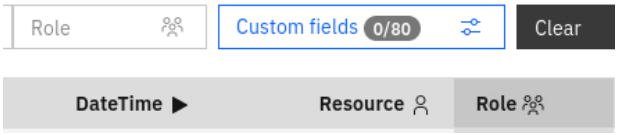
4.3.5 Map Column to Role

_1. Select **Role** column

_2. Click **Role** button to complete the mapping

_3. On Field mapping click **OK**

You should now see the people icon on the Role column



4.3.6 Map data columns to custom fields

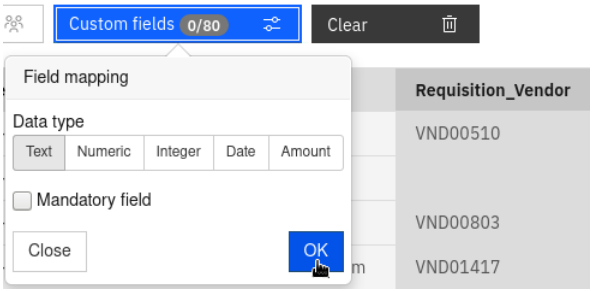
Custom Fields include additional relevant process data. They are commonly referred to as the business data. When you map a Custom field, you must specify the type of data contained in the respective column and whether the field is mandatory for every event (every line of the log file).

4.3.7 Map Requistion_Vendor Column to Custom Field

_1. Select **Requisition_Vendor** column

_2. Click **Custom Fields** button to complete the mapping

_3. On *Filed mapping* select *Data type* of **Text** and keep *Mandatory field* **un-selected**, then click **OK**



You should now see the tag icon on the Requisition_Vendor column and Custom Fields icon mapped fields count set to 1/80 (you can map maximum of 80custom fields).

4.3.8 Map other columns to Custom Field

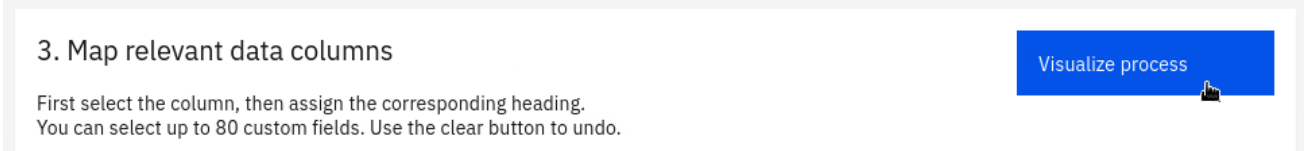
_1. Repeat the above steps to map the following columns as Custom Fields:

- Requisition_Type
- Requisition_Header
- UserType

4.4 Create Visualization

After mapping the log file, you can visualize the process by creating process Model. Every time something changes in the Workspace or more data is added you will need to recreate the process Model.

_1. To create or update your visualization click in **Visualize process**



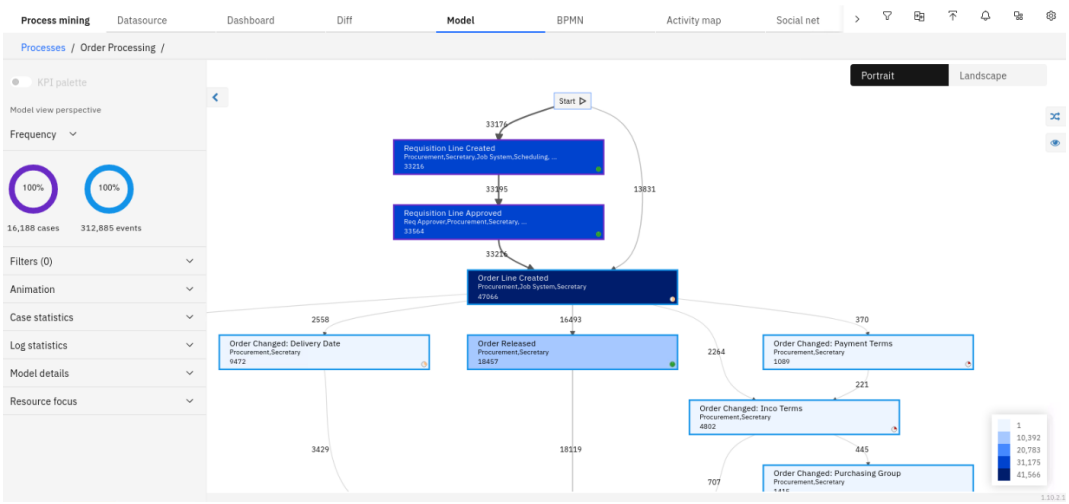
You should now see

5 Explore the Process Model

We will now explore the major process mining information derived from the process data: Model, Dashboard, BPMN, Activity map and Social net.

5.1 Model

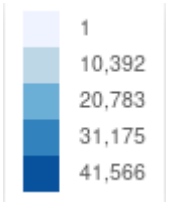
You should now see the process Model displayed.



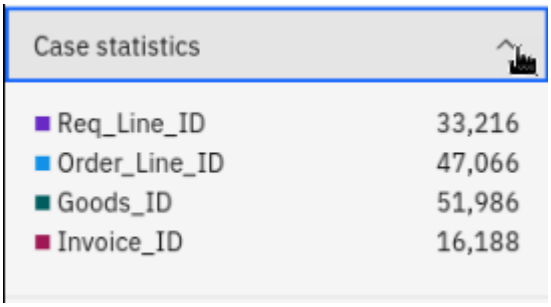
The Model automatically displays the frequency analysis. The dark blue color highlights the most frequent activities, whilst the bold arrows highlight the most frequent transitions. In this way, the most frequent paths between activities of the process can be identified.

- The numbers next to the lines shows how many times that specific process flow has been followed.
- The numbers within the rectangles shows the number of times that the activity is performed
- The description in the rectangles indicates the name of the activity and the roles by which the activity is carried out. They could be more than one role (multiple roles followed by dots are displayed).

- The green circle at the bottom right corner of the activity rectangle indicates the Model coverage (100% indicates that the Model details cover all the possible relationships of that activity. The percentage indicates how many possible relationships you are currently visualizing. The level of relations is adjustable)
- The color saturation of Activity reflects how often an activity was invoked (the frequency). The legend gives you the frequency coloring detail

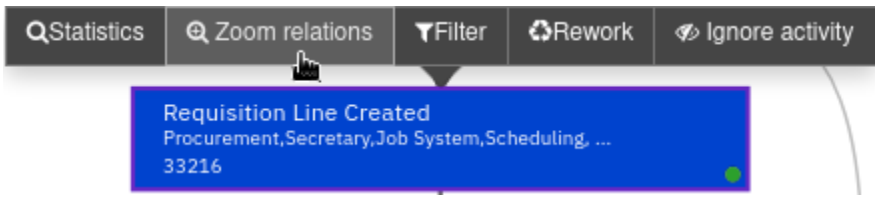


- The Activity border reflects the multilevel nature of the process. See the Case Statistics legend to decipher the color schema

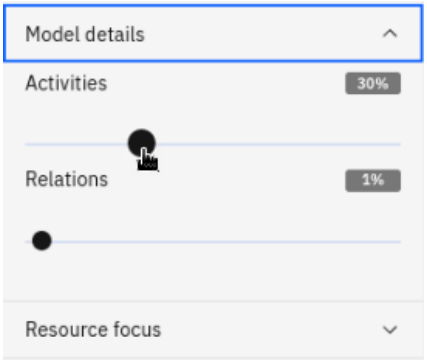


Finally, note that, by default, the visualization does not show all the relationships and activity instances. This is to reduce unnecessary complexity that can impair visualizing and exploring the process. There are two ways to get a more detailed view:

1. You can select **Zoom relations** after you click on an **Activity**



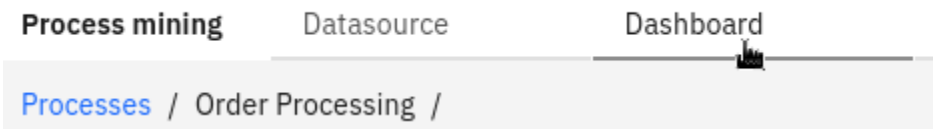
2. You can also control % of Activities (occurrences) and % of Relations by expanding Model details section. Selecting 100% for each setting will result in a “spaghetti” style visualization!



There are many other ways to get insights into the processes using the Model view. We will cover this in other hands-on labs!

5.2 Dashboard

_1. Click **Dashboard** tab

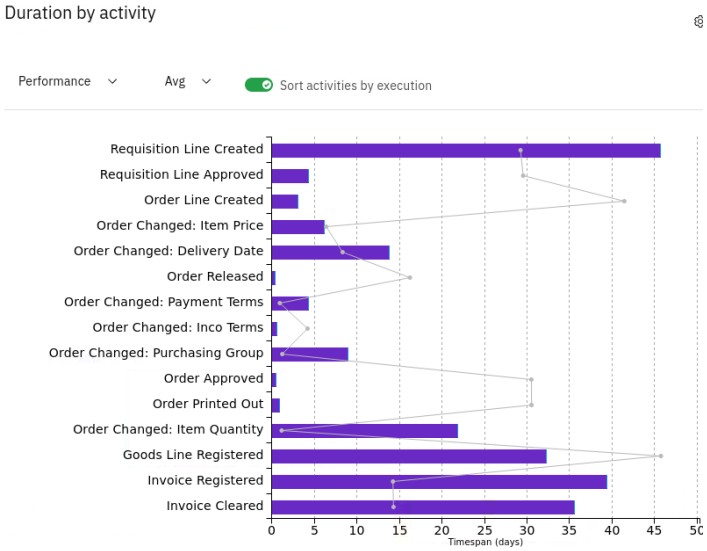


Let’s explore each dashboard...

5.2.1 Process Details

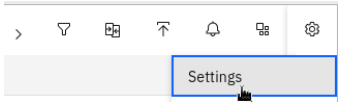
This dashboard contains process and case statistics as well as high level performance statistics related to time. If a reference model exists this dashboard also contains summary of conformance with the reference model

5.2.2 Duration by activity

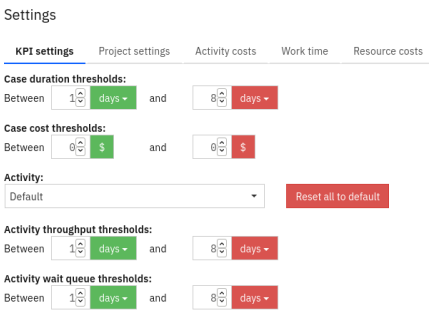


This dashboard displays activities duration (average or median) either absolute or how the durations compare with the KPIs defined in the project settings.

Note to view the KPI, select Settings from the top menu



And select the KPI tab



5.2.3 Performance Drilldown

You can use this dashboard to identify most critical activities (in terms of frequency and performance), and most critical resources (resources who are most frequently and are involved with critical activities)
This dashboard enables you to drill down on most critical activities and resources (users performing the tasks).
You can also examine activity and resource performance over time. For example you can see an *Activity waiting* queue durations or a *Resource load* variation over time.
The **Timespan** makes you choose a period of time to focus your analysis on.
In Case duration and count the colored line shows average/median remaining lead time of cases running in the selected date. And the grey bar shows number of cases running in the selected date.

Average duration and count represents, for the selected activity: average/median remaining service time, based on the cases running on the activity in the selected date (colored line), and number of activities running in the selected date (gray line).

Activity waiting queue represents, for the selected activity: average/median remaining waiting time, based on the cases waiting for the activity in the selected date (colored line), and number of cases waiting for the activity in the selected date (gray line).

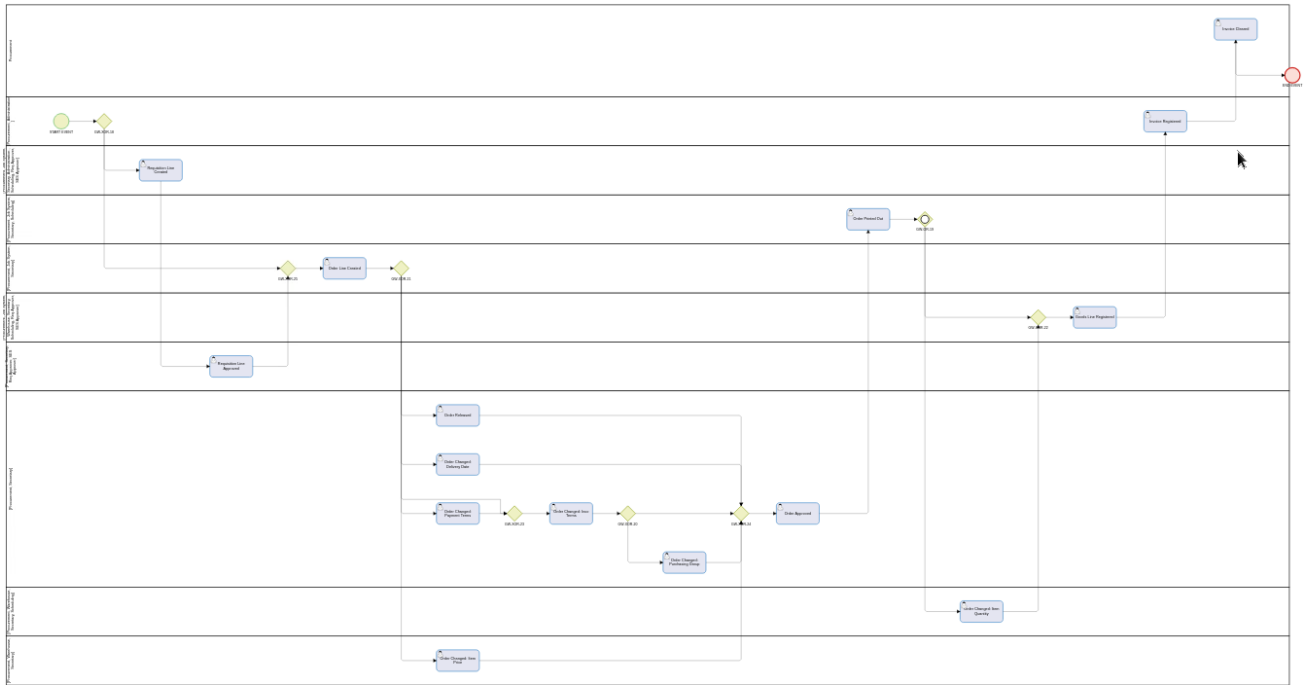
Active load allows to understand what resources are involved in each activity. By selecting a specific activity from the drop-down menu, you will obtain a dotted chart visualization that shows: the name of the resource that have carried out the activity in every swim lane, and the exact moment (relative to the timespan) in which a specific resource carried out the activity (represented by the small bullet points identify)

Resource load displays the workload of every resource. By selecting a specific resource from the drop-down menu you will obtain a dotted-chart visualization that shows: the name of the activity that had been carried out by the resource in every swim lane, and the exact moment (relative to the timespan) in which a specific activity had been carried out by the resource (identified by small the bullet points identify

5.3 BPMN

_1. Click **BPMN** tab

You will see the BPMN diagram on the left:



Note the BPMN related features on the right:

- Rules Discovery - The Decision Rules Mining capability can automatically discover the correlations within the data mined data and enables automatic detection of the decision rules governing the process.
- Overview – Provides an overview of the rules discovery results
- Settings – Used to configure and refine the decision rules mining settings
- Publish – Enables to save a snapshot of the current model in the BPA tool. Snapshots can then be published as BPMN2 files.
- Edit a Copy – Use it to edit a copy of the actual model. Both the Publish and Edit a Copy commands will load the BPA tool.
- Simulation – Enables to create a simulated scenario based on the current BPMN model, derived from the process data.

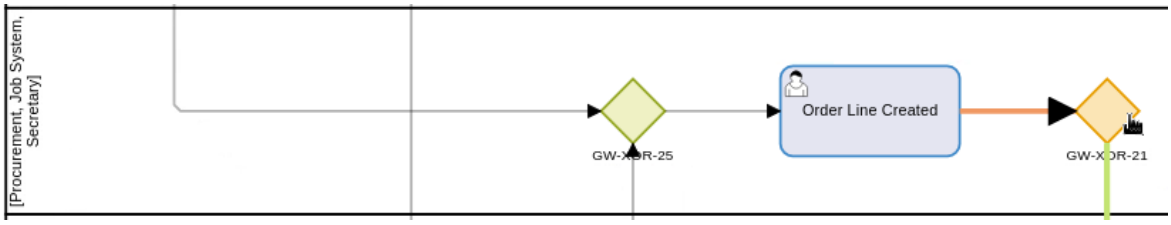
5.3.1 Rules Discovery

_1. Click **Rules Discovery** tab

_2. Wait for the “Discovering decision rules…” pop up to disappear

_3. Find the **GW-XOR-21** gate on the BPMN diagram and **double-click** it

Hint: Use the mouse wheel to zoom and mouse right-button to move the BPMN diagram.



Note the decisions generated form the process mining data:

Gateway info: GW-XOR-21

Rules overview

Rules overview | Reduce | Elaborate

Order Line Created → Order Changed: Delivery Date

```
Purchasing_Group in ["II6", "IIB", "IID"]
AND Material_Number not in [Missing, "S150020101", "S150021101"]
AND Order_Header not in ["4500189397", "4500199545", "4500200794"]
OR
Purchasing_Group in ["II3", "II8", "IIE"]
AND attr-resource in ["ACQ01", "USR00600", "USR02069"]
AND Order_Vendor in ["VND05362", "VND05955", "VND06216"]
AND Order_Header in ["4500248874", "4500251352", "4500258513"]
OR
Purchasing_Group in ["II3", "II8", "IIE"]
AND attr-resource not in ["ACQ01", "USR00600", "USR02069"]
AND Order_Vendor in ["VND06322", "VND07617", "VND07995"]
AND Order_Header not in ["4500196291", "4500200761", "4500215864"]
```

Order Line Created → Order Changed: Inco Terms

```
Purchasing_Group in ["II3", "II8", "IIE"]
AND attr-resource not in ["ACQ01", "USR00600", "USR02069"]
AND Order_Vendor in ["VND04890", "VND06230", "VND06922"]
OR
Purchasing_Group in ["II3", "II8", "IIE"]
AND attr-resource in ["ACQ01", "USR00600", "USR02069"]
AND Order_Vendor not in ["VND05362", "VND05955", "VND06216", "VND06546", "VND06863", "VND07704"]
```

For each rule, the target transition is indicated (in the form “Gateway activity → Target activity”), and the rule’s conditions are shown underneath. Note the business data is used on the conditions!

The green circle indicates the Coverage of the decision rule: percentage of events in which the rule’s condition was the specified one, out of the total number of occurrences of that transition.

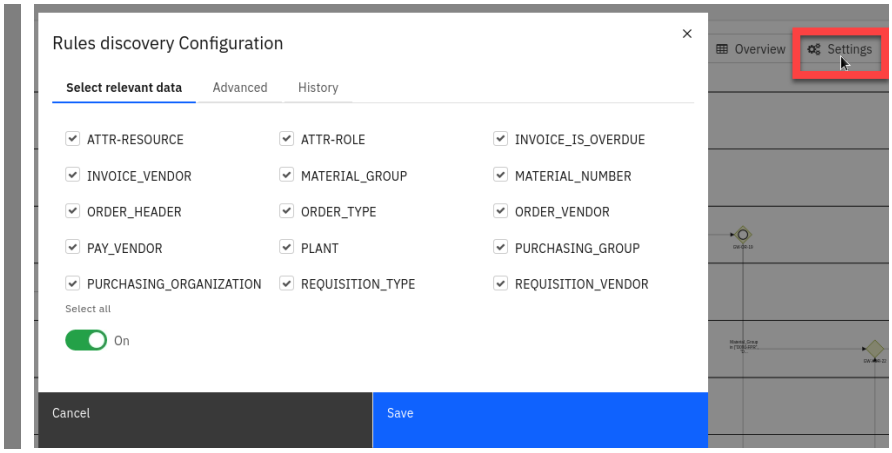
The Coverage decreases when the transition occurs in the cases, but the rule’s condition is not the specified one. These transitions are called “immigrants”.

The orange circle indicates the Precision of the decision rule: percentage of events in which the rule’s condition was met, out of the total number of events in which the rule’s condition was the specified one.

The Precision decreases if the condition was specified in the cases but instead of the expected transition, another transition occurs. These transitions are called “emigrants”.

The Reduce / Elaborate button allow you to reduce / increase the rule complexity. Use the depth-reduction when you want a more concise and summarized view of the gateway’s rules.

Note that you can use the Setting button launch Rules discovery Configuration which you can use to select what variables are used in decision definitions



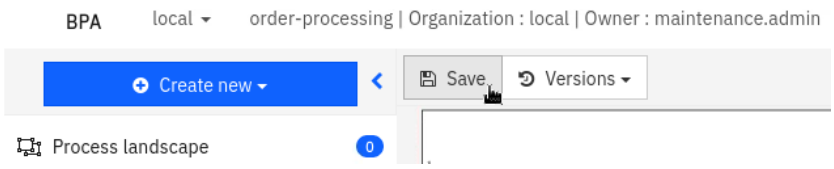
_4. Click **x** to close the *Gateway info: GW-XOR-21* window

5.3.2 Publish

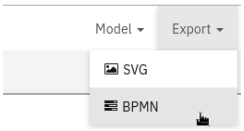
_1. Click **Publish**

Note that this action takes you away from Process Mining to the BPA (Business Process Analysis) environment.

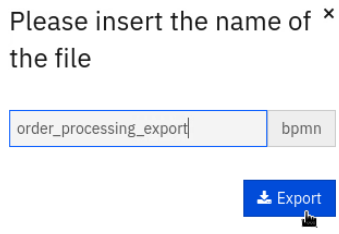
_2. Click **Save** to create a new Snapshot



_3. Click **Export > BPMN**

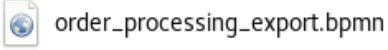


_4. Change file name to **order_processing_export** and click **Export**



_5. Select a directory of your choice.

Note the generated BPMN file:



> Note that once you create a BPMN file you can import it to the following Digital Business Automation process tools:
> **IBM Blueworks Live** by using Import BPMN File feature:

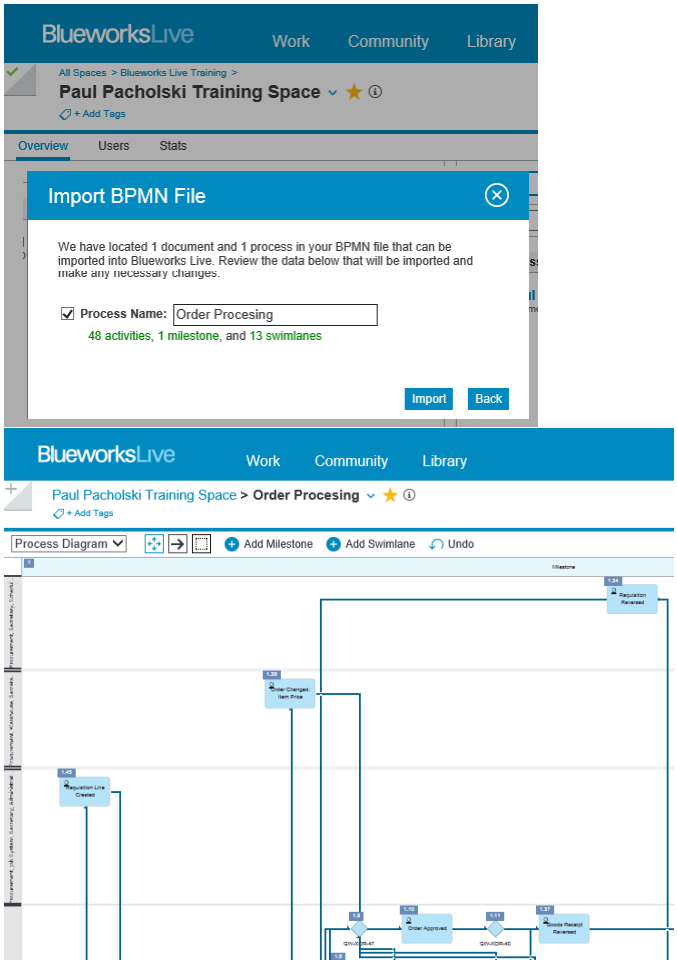


Figure 1. ORDER PROCESSING PROCESS IN IBM BLUEWORKSLIVE

IBM Business Automation Workflow by selecting Import on the Process Apps View

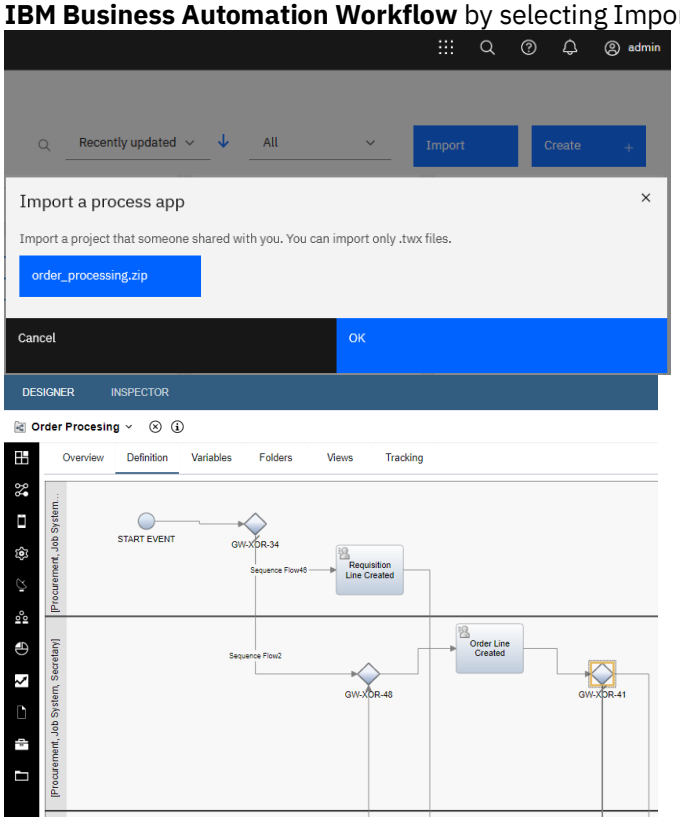
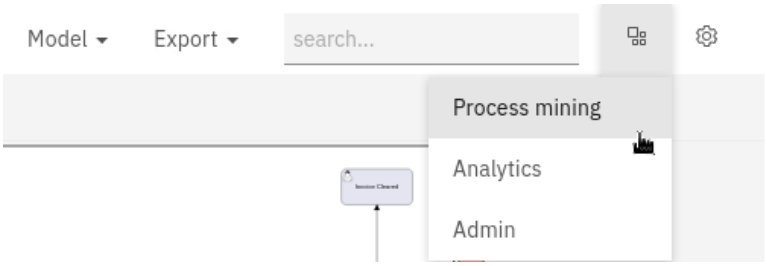


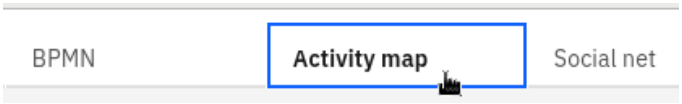
Figure 2. ORDER PROCESSING PROCESS IN IBM Business Automation Workflow

5.4 Activity Map

_1. Click the **chess-board icon** and then **Process mining**



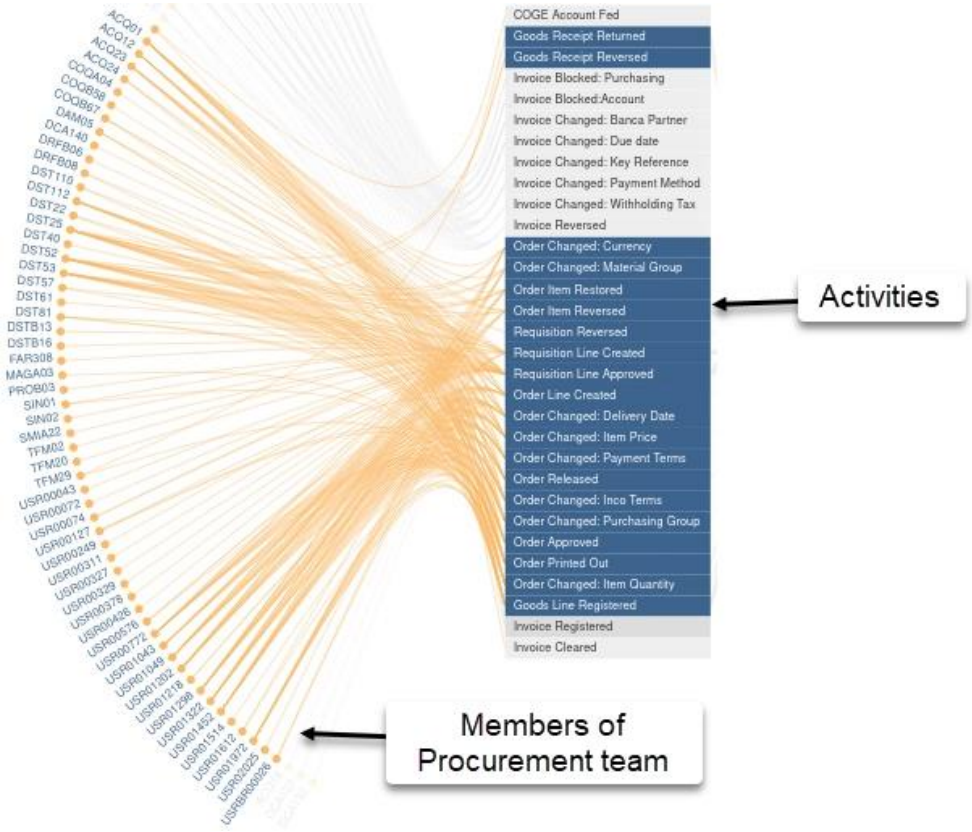
_2. Click **Activity map**



Activity Map can be used to analyze human resources by name and job title. It highlights if employees are doing what they are supposed to be doing. For example, by using Activity map, we can discover that the Procurement Team is managing activities not included in their duties.

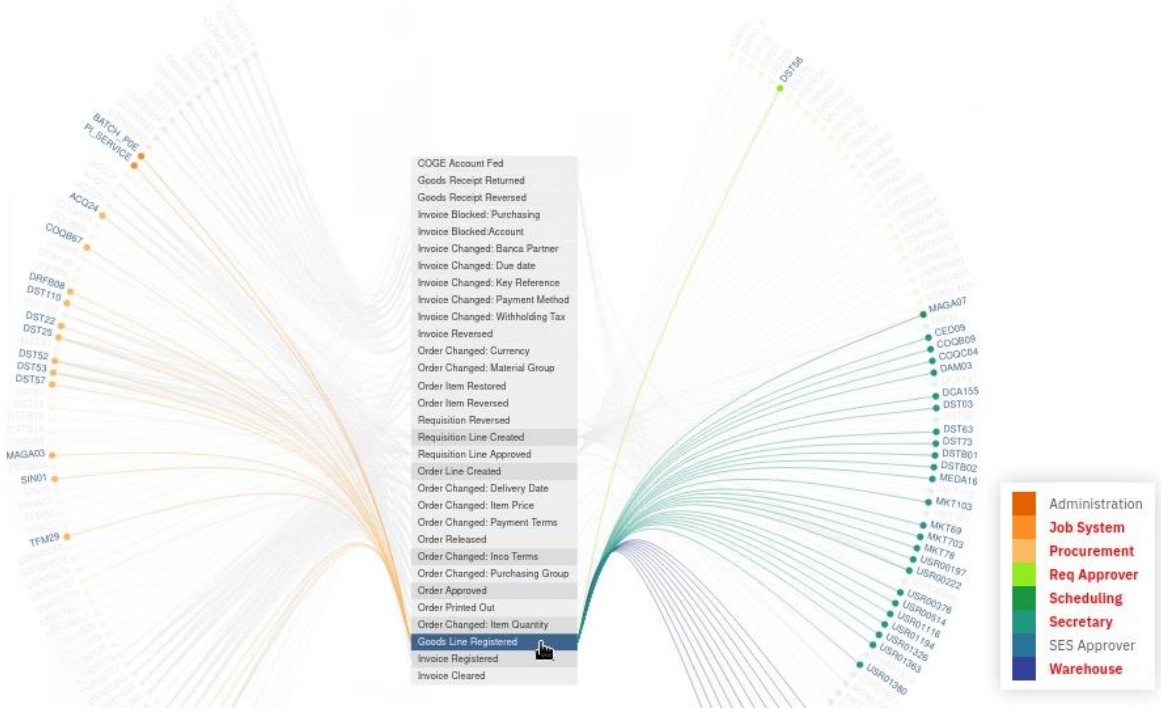
_3. Click **Procurement**

Note all the activities that Procurement Team members are involved in! Also note the large number of users (user ids) that are part of the Procurement team.



_4. **Click Goods Line Registered**. Notice the six Teams (highlighted in red) are involve in completing this task.

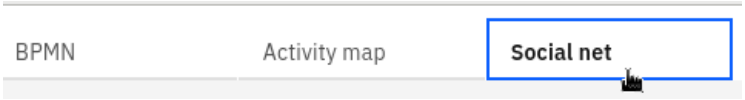
Hint: Use the mouse wheel to zoom and mouse right-button to move the Activity map diagram.



5.5 Social Net

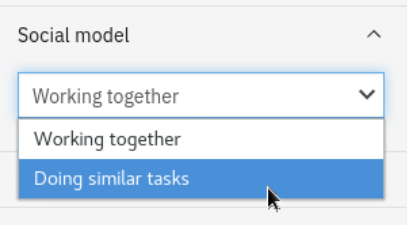
The Social net allows you to discover and analyze the relationships between users and groups that are formed within a process. We can divide these relationships into two social models, selectable from the dropdown menu.

_1. Click **Social net**

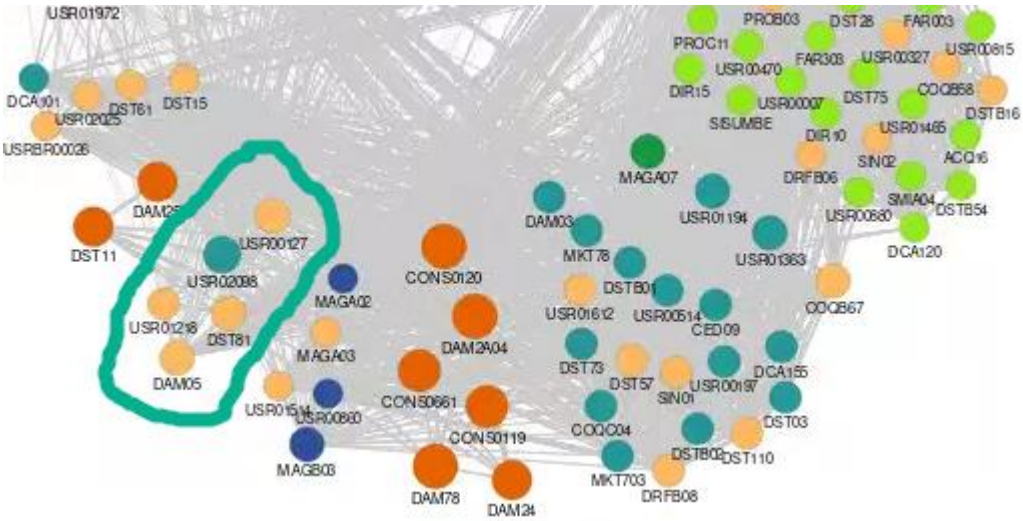


Let's explore *Doing similar tasks* view...

_2. Click **Social model > Doing similar tasks**



Notice a cluster (highlighted in green) discovered by *Doing similar tasks* view

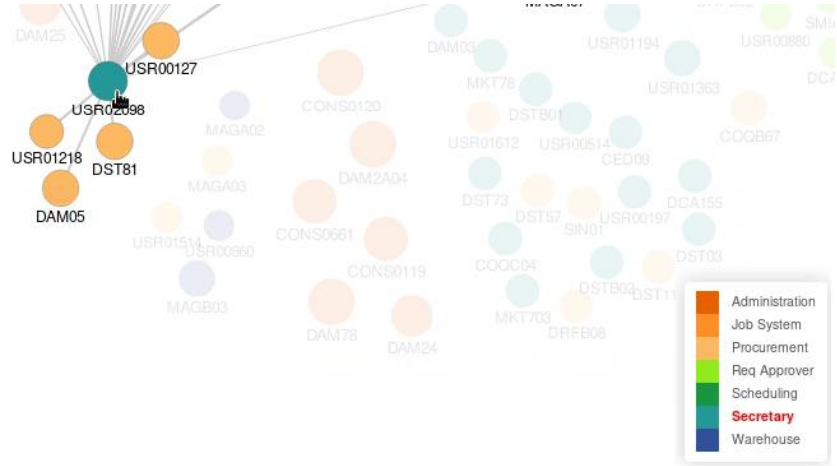


In the *Doing similar tasks* view:

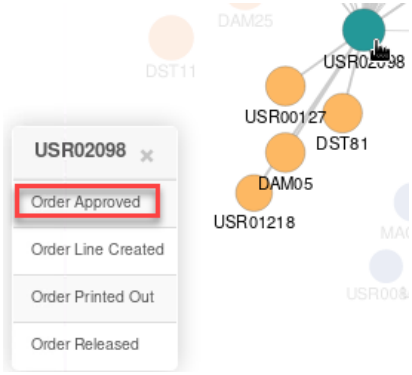
- The bullets represent resources
- Resources are clustered by common activities carried out
- The bullet will be bigger for those resources who are sharing more activities
- Different colors identify different roles

_3. Hover the pointer over the **blue green USR02098** dot.

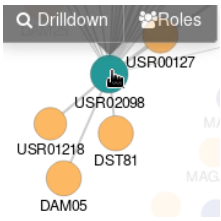
Notice that the user USR02098 is a Secretary while all the other users performing similar activities belong to the Procurement team



_4. Click **USR02098**, and that this user is performing Order Approval! Clearly this is not a role of a member of Secretaries team!



_5. Select *USR02098* dot and click **Drilldown**



Notice that this user is typically performing many *Order Approved* Activities!

USR02098

Req_Line_ID	Order_Line_ID	Goods_ID	Invoice_ID	Activity	DateTime	Resource	Role	Requisition
0010234119_10	4500240631_10			Order Line Created	2018-07-09 17:50:03	USR02098	Secretary	
0010237169_10	4500243295_10			Order Line Created	2018-07-23 17:54:11	USR02098	Secretary	VND02905
	4500240631_10			Order Released	2018-07-09 17:51:04	USR02098	Secretary	
	4500243147_10			Order Approved	2018-07-23 14:47:15	USR02098	Secretary	
	4500243266_10			Order Approved	2018-07-23 16:29:48	USR02098	Secretary	
	4500243266_20			Order Approved	2018-07-23 16:29:48	USR02098	Secretary	
	4500243166_10			Order Approved	2018-07-23 16:30:57	USR02098	Secretary	
	4500243241_10			Order Approved	2018-07-23 16:32:20	USR02098	Secretary	
	4500243177_10			Order Approved	2018-07-23 16:32:39	USR02098	Secretary	

This finding is confirmed by the size of user's USR0298 dot which indicates that the users shares large number of similar activities in other users in the cluster.

5.6 Lab Summary

In this lab you have learned the basics of IBM Process Mining tools. You should now know:

- how to create a process from mined process data,
- be familiar with key process mining features and their value.

Congratulations, you have successfully completed IBM Process Mining Introduction Lab