Advanced Process Mining

Sommer term 2020

Exercise sheet 3

DFG Limitations • DFG Soundness • DFG to PNG

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Limitations of the Directly-Follows Graph

Exercise 1a

#	Trace
100	abcef
90	abecf
87	abdef
85	abedf
3	abef
1	abcdef

Draw a Directly-Follows Graph for the event log above.

Limitations of the Directly-Follows Graph

Exercise 1a

Given the event log. create a directly follows graph for traces observed:

1. Create a table with pairs of consecutive activities and their quantity

$>_L$	a	b	c	d	e	f	E
S	366						
a		366					
b			101	87	178		
c				1	100	90	
d					88	85	
e			90	85		191	
f							366

#	Trace
100	abcef
90	abecf
87	abdef
85	abedf
3	abef
1	abcdef

Limitations of the Directly-Follows Graph

Exercise 1a

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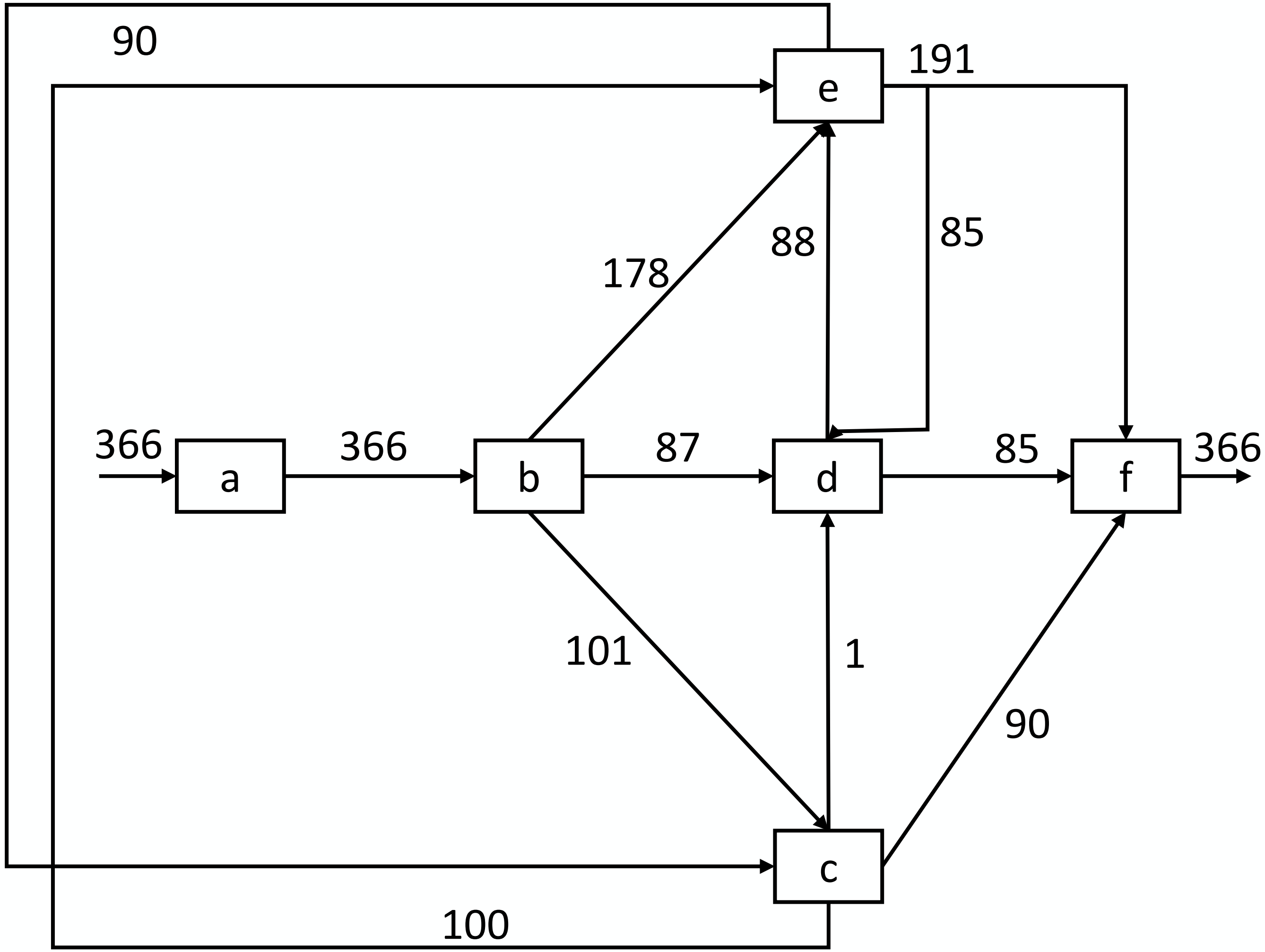
2. Draw the Directly-Follows Graph from the collected information in the table:



$>_L$	a	b	c	d	e	f	E
S	366						
a		366					
b			101	87	178		
c				1	100	90	
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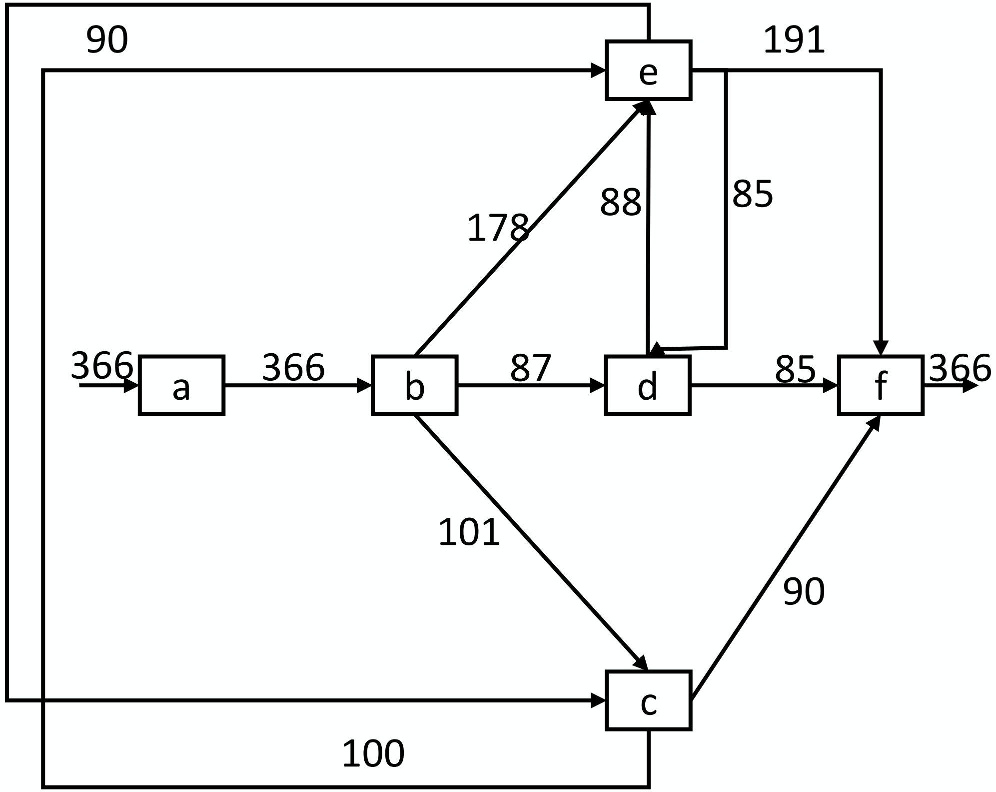
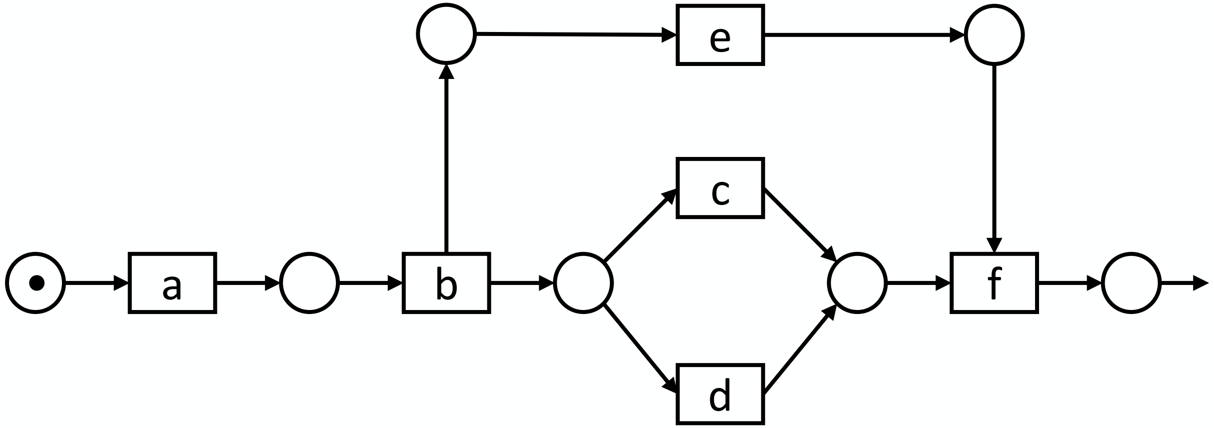
e			90	85		191	
f							366

Limitations of the Directly-Follows Graph

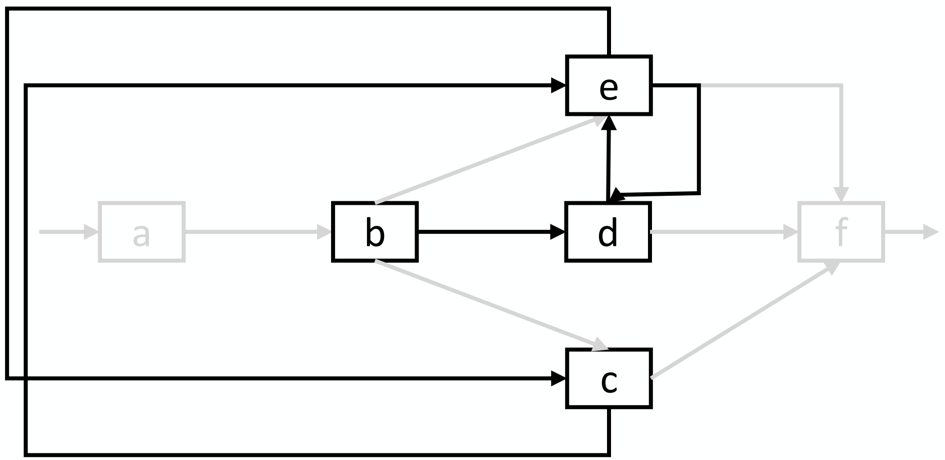
Exercise 1b

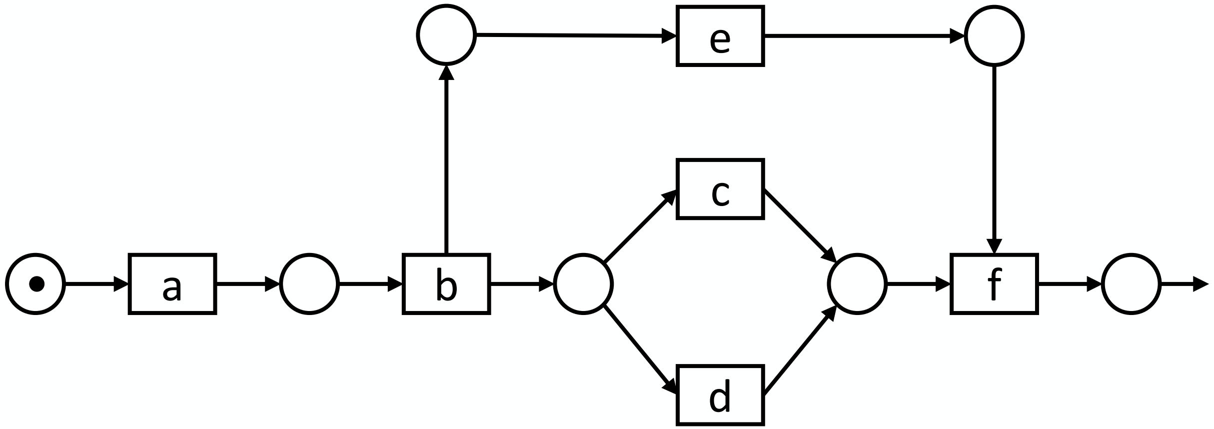




Compare the Directly-Follows Graph with the Petri net above.
Does the DFG allow for behaviour that is not allowed according to the Petri net?

Limitations of the Directly-Follows Graph
Exercise 1b





The Directly-Follows Graph allows for a loop involving activities c, d and e.
The Petri net from which the event log was created does not permit any loops involving activities c and d. According to the Petri net there is an exclusive choice between c and d.

Limitations of the Directly-Follows Graph

Exercise 1c

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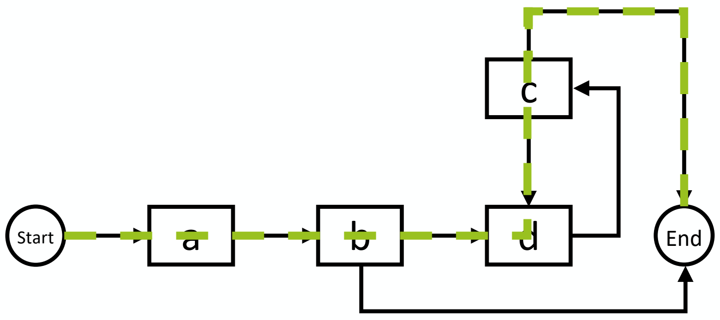
Explain the following thresholds:

τ_{var}	Defines the thresholds for the minimal number of traces for each variant included (based on $\#_L(\sigma)$).
τ_{act}	Defines the minimal number of events for each activity included (based on $\#_L(a)$).
τ_{df}	Defines the minimal number of direct successions for each relation included (based on $\#_L(a, b)$).

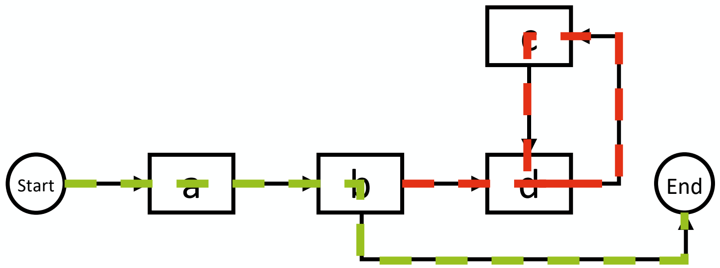
Soundness in Directly-Follows Graphs
Exercise 2a

Define soundness in DFG in a non-formal way.

A DFG with N (the set of nodes) and E (the set of edges) is sound, if every node $x \in N$ is on a path from start to end.



Sound



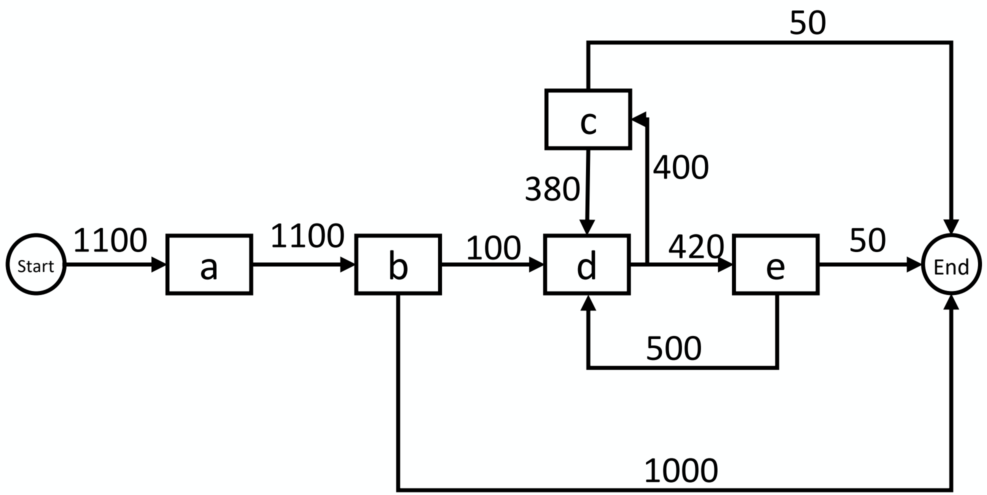
Unsound

Soundness in Directly-Follows Graphs

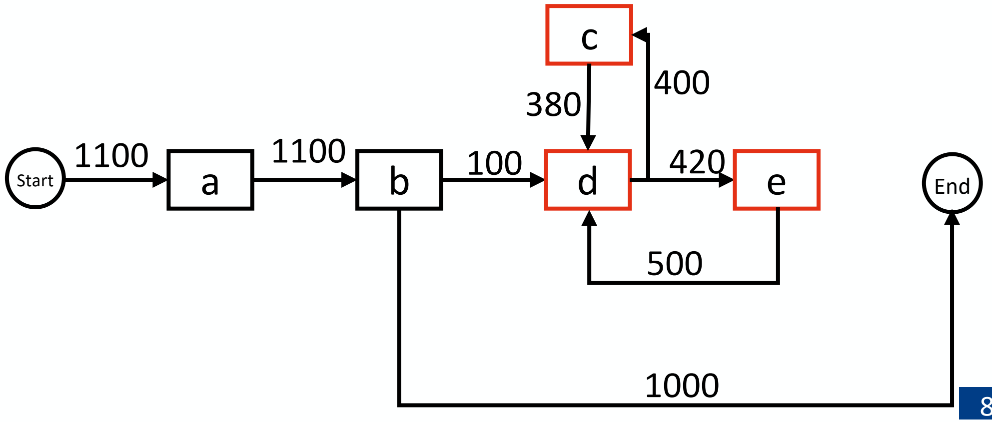
Exercise 2b

How can a sound DFG be turned into an unsound Graph?

To reduce the complexity of a DFG, edges might be filtered out, possibly resulting in deadlocks and an unsound Graph.



$\tau_{df} > 70$



Transformation from DFG to PN

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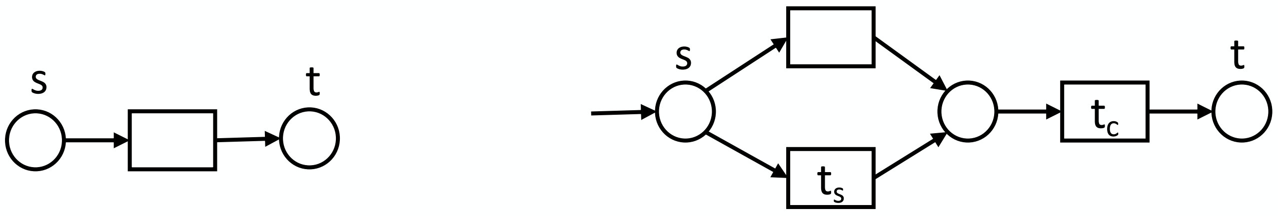
In order to compute performance measures, each transition has to be modelled as a start and end event.

Source: DFM consisting of (N, E)

Target: PN consisting of (P, T, F)

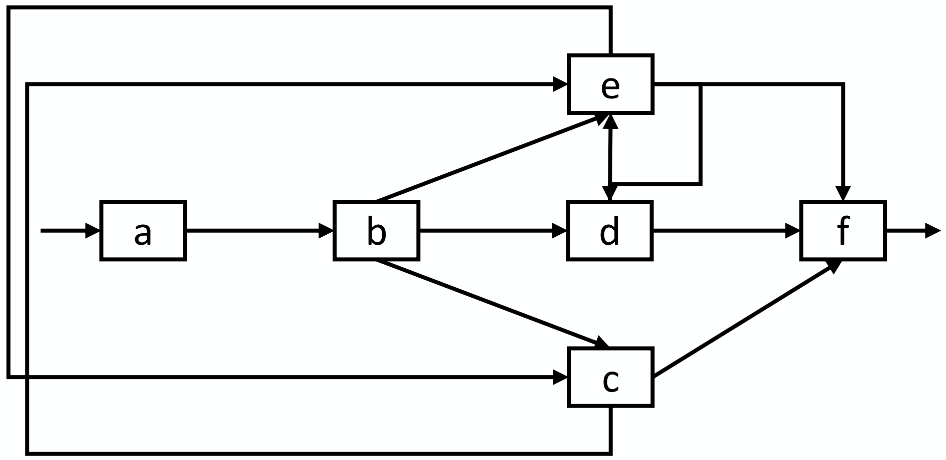
For each edge $(s, t) \in E$ subgraphs will be created.
There is a differentiation between the *end node* and the other nodes:

If t is *end* If t is not *end*



Transformation from DFG to PN

Exercise 3



Transform the DFG above into a Petri net.
Model each transition as a combination of start and end event.

Transformation from DFG to PN

Exercise 3