



# Disco

Process Mining has arrived. Finally.



## Process Mining & Audit

*Mei 2018, Mike van Bussel*

Versie 1.94 – ISACA Noordelijke Round Table



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Bedankt voor uitnodiging,  
Assen!

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# Even voorstellen

- Mike van Bussel
  - Data consultant en data analist @ Rabobank
  - IT audit achtergrond
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- Process Mining ervaring
  - Eindhoven University of Technology
  - DLL (oud De Lage Landen)
  - KPMG IT Advisory
  - Rabobank
- Voeg mij toe op LinkedIn ik blijf graag in contact!
  - <https://www.linkedin.com/in/mikevanbussel>



# Context

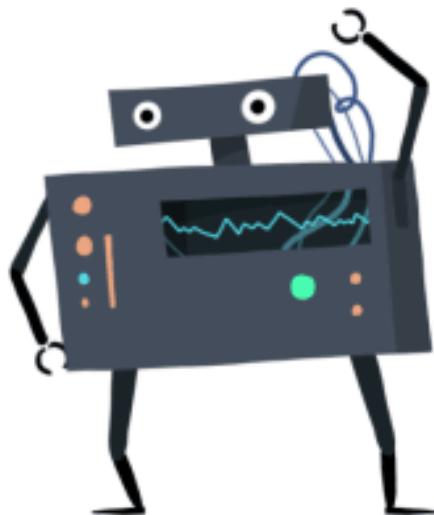


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- De wereld verandert

Business and Financial Operations ▾

Accountants and Auditors ▾



Accountants and Auditors have a

**93.5%**

chance of being automated.

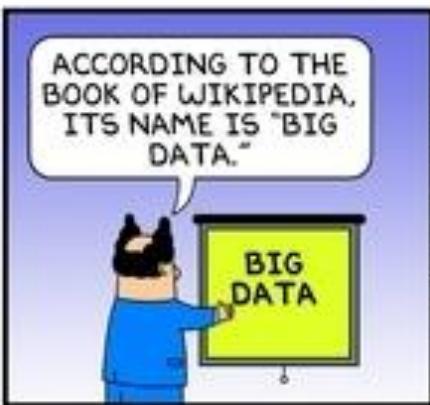
# Context



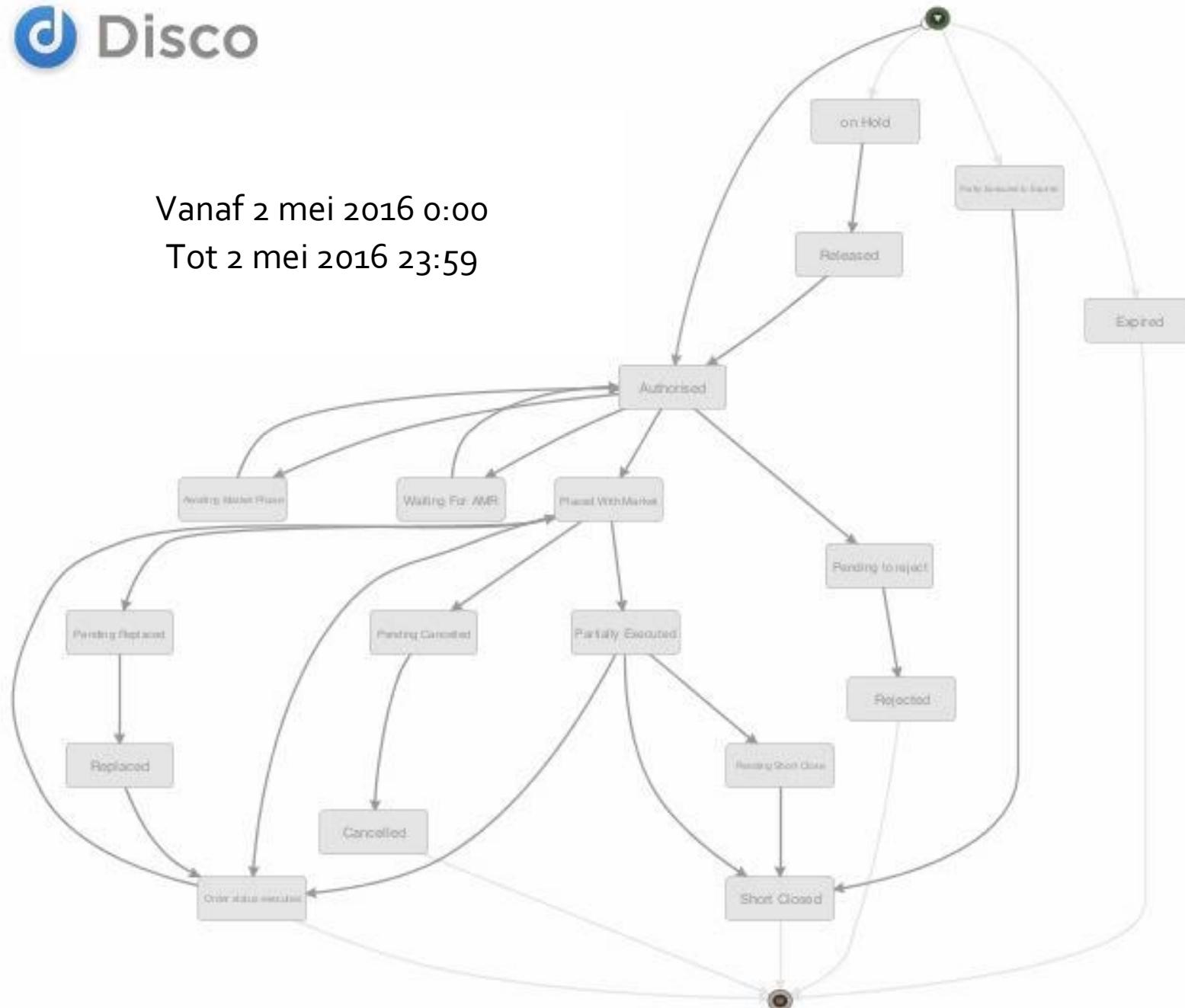
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- De wereld verandert

DILBERT



Vanaf 2 mei 2016 0:00  
 Tot 2 mei 2016 23:59

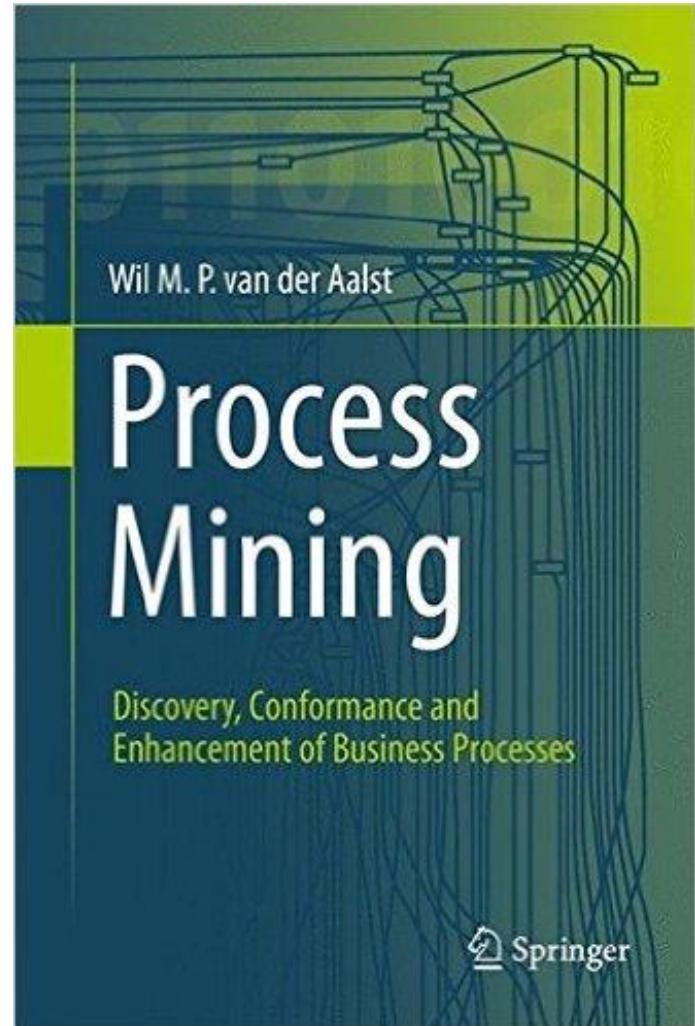


# Inleiding



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- Top van de ijsberg over:
  - Data analyse in audit
  - Positionering Process Mining
  - Elementen van Process Mining
  - Process Mining tools
  - Algoritmes van Process Mining





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# Data analyse in de audit

- Data analyse kan bijdragen aan:
  - Het verkrijgen van meer zekerheid
  - Het verkrijgen van betere inzichten
  - Het aanbrengen van focus





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# Data analyse bij Rabobank

- Steun MT Audit
- Dedicated team
- Data Driven mindset

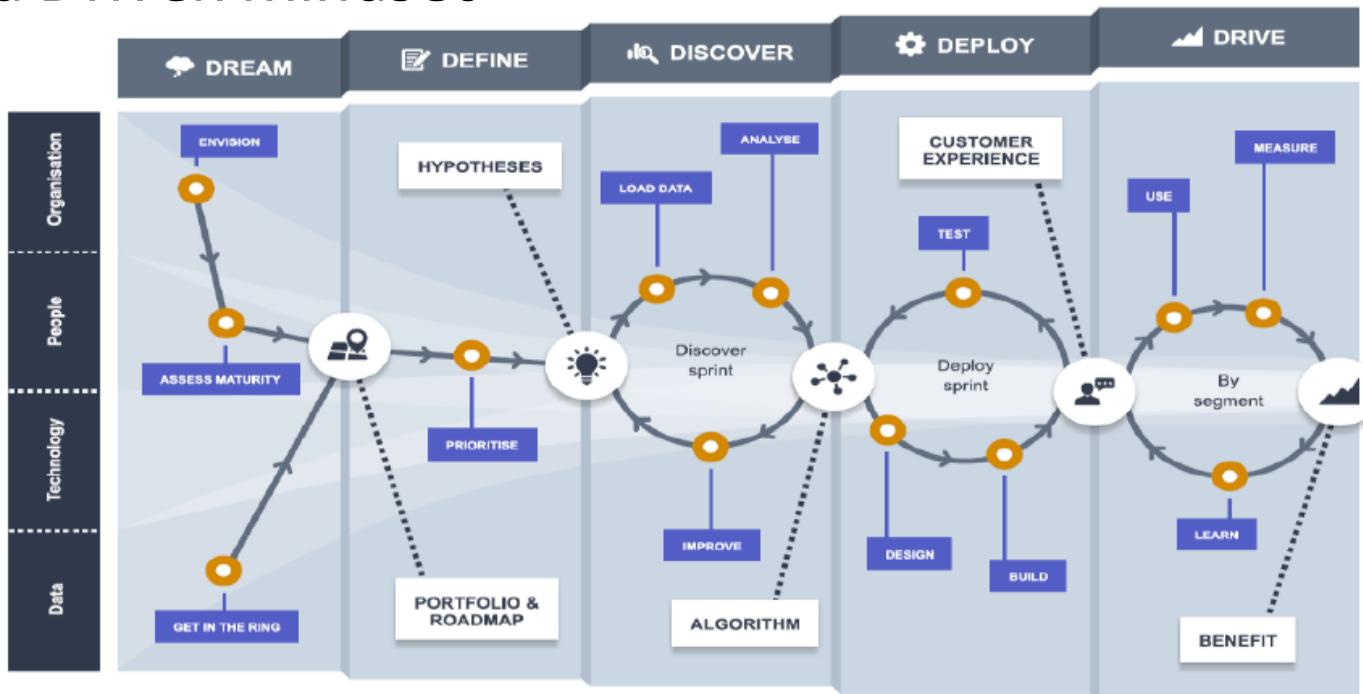


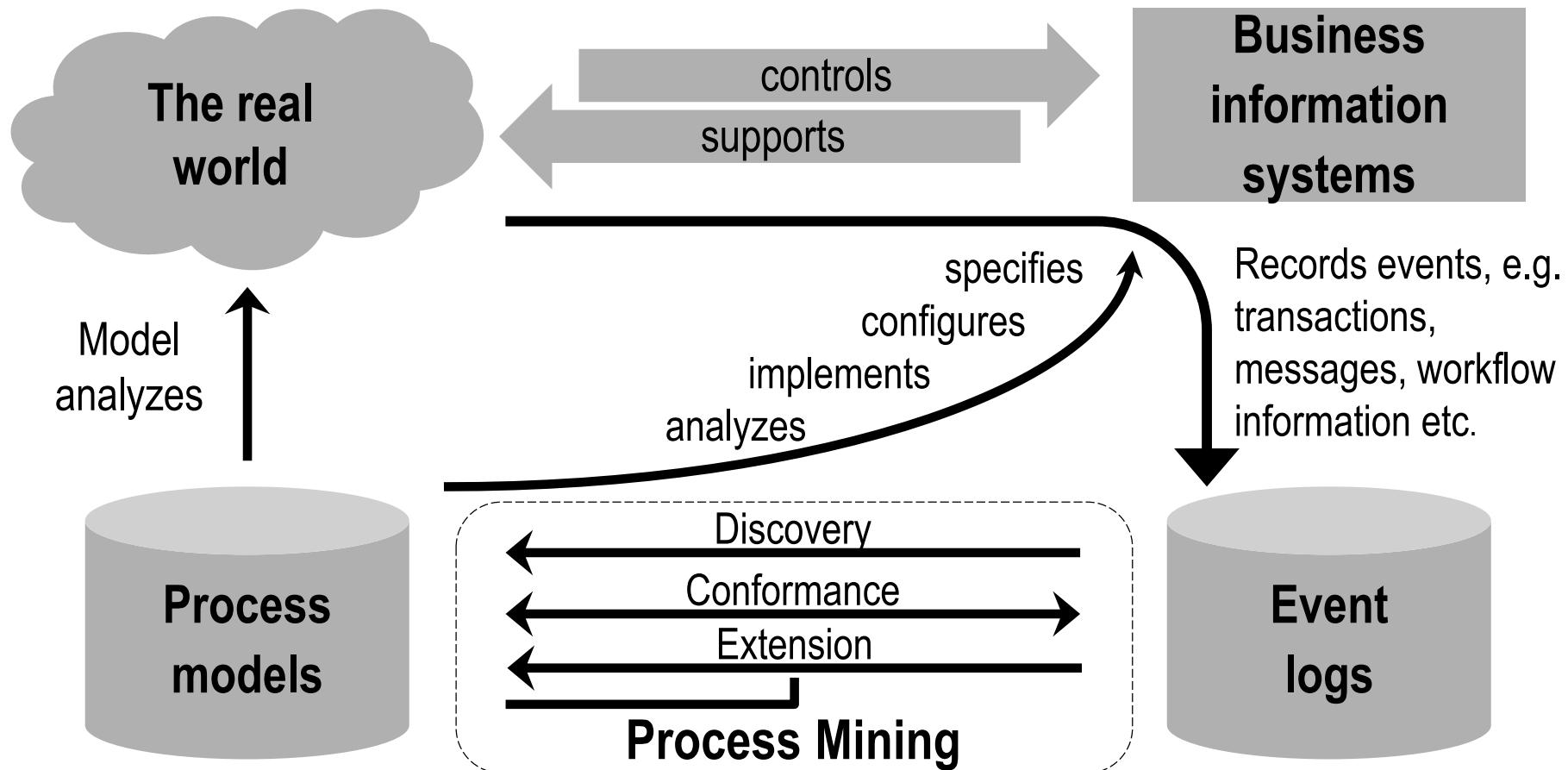
Figure: Think big, act small, scale fast approach

# Data analyse bij Rabobank

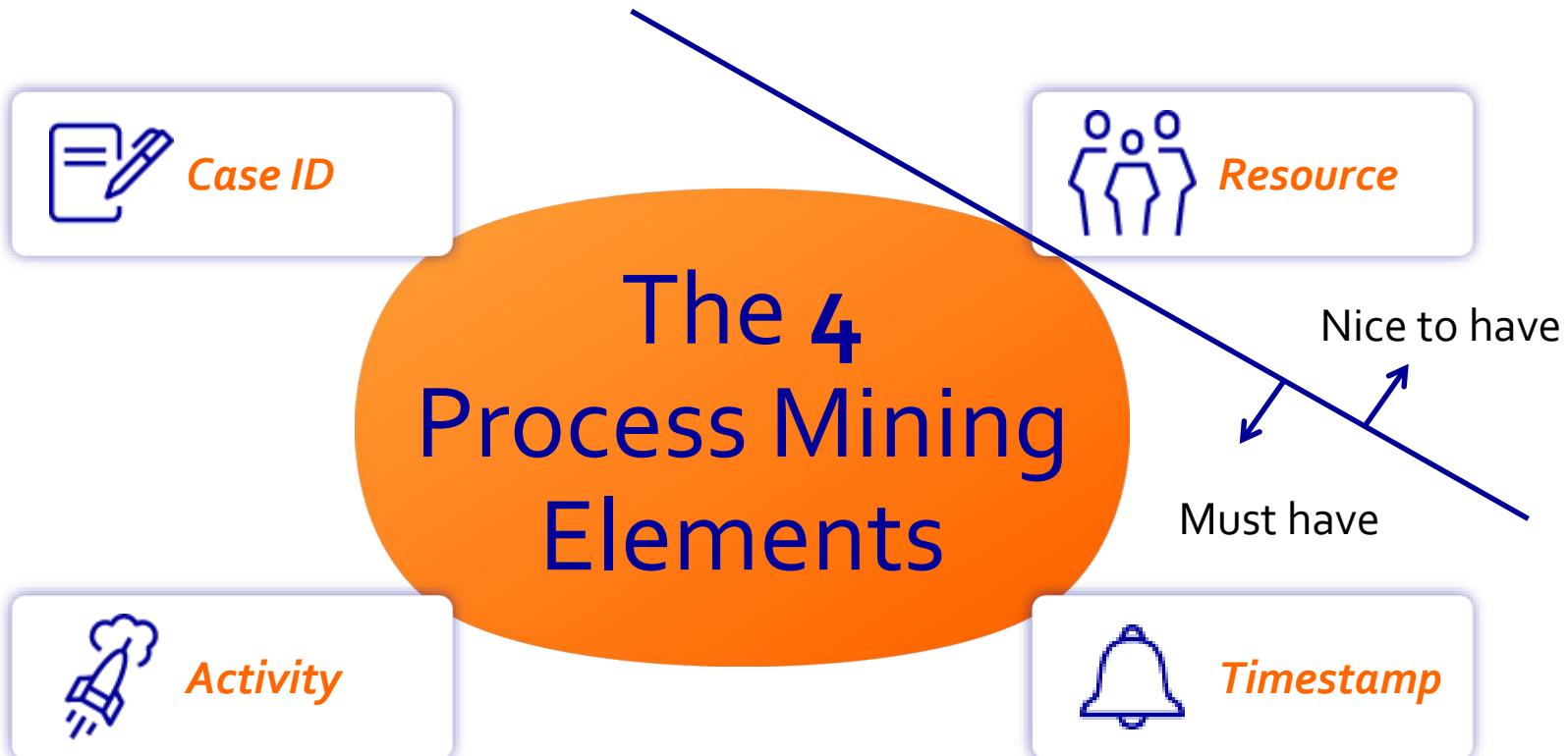


- Think Big
  - We took some time to *dream* a vision on Data Driven Assurance and *define* a portfolio of Showcases to *show* its value
- Act Small
  - We delivered the showcases to *discover* the actual benefits based on data pipeline automation and analytics
- Scale Fast
  - We build the capabilities to *deploy* successful pilots and *drive* the benefits throughout the pools

# Positioning Process Mining



# Elementen Process Mining



# Process Mining Tools



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 Discover your processes.

celonis



QPR

Dare to improve.

perceptive software  
from Lexmark

my  nvenio



icris

measure facts, treasure knowledge

FUJITSU Software Interstage

En vele anderen...

# Alpha algorithm

Let  $W$  be a workflow log over  $T$ .  $\alpha(W)$  is defined as follows.

1.  $T_W = \{ t \in T \mid \exists_{\sigma \in W} t \in \sigma \},$
2.  $T_I = \{ t \in T \mid \exists_{\sigma \in W} t = \text{first}(\sigma) \},$
3.  $T_O = \{ t \in T \mid \exists_{\sigma \in W} t = \text{last}(\sigma) \},$
4.  $X_W = \{ (A, B) \mid A \subseteq T_W \wedge A \neq \emptyset \wedge B \subseteq T_W \wedge B \neq \emptyset \wedge \forall_{a \in A} \forall_{b \in B} a \rightarrow_W b \wedge \forall_{a_1, a_2 \in A} a_1 \#_W a_2 \wedge \forall_{b_1, b_2 \in B} b_1 \#_W b_2 \},$
5.  $Y_W = \{ (A, B) \in X \mid \forall_{(A', B') \in X} A \subseteq A' \wedge B \subseteq B' \Rightarrow (A, B) = (A', B') \},$
6.  $P_W = \{ p_{(A, B)} \mid (A, B) \in Y_W \} \cup \{ i_W, o_W \},$
7.  $F_W = \{ (a, p_{(A, B)}) \mid (A, B) \in Y_W \wedge a \in A \} \cup \{ (p_{(A, B)}, b) \mid (A, B) \in Y_W \wedge b \in B \} \cup \{ (i_W, t) \mid t \in T_I \} \cup \{ (t, o_W) \mid t \in T_O \},$  and
8.  $\alpha(W) = (P_W, T_W, F_W).$

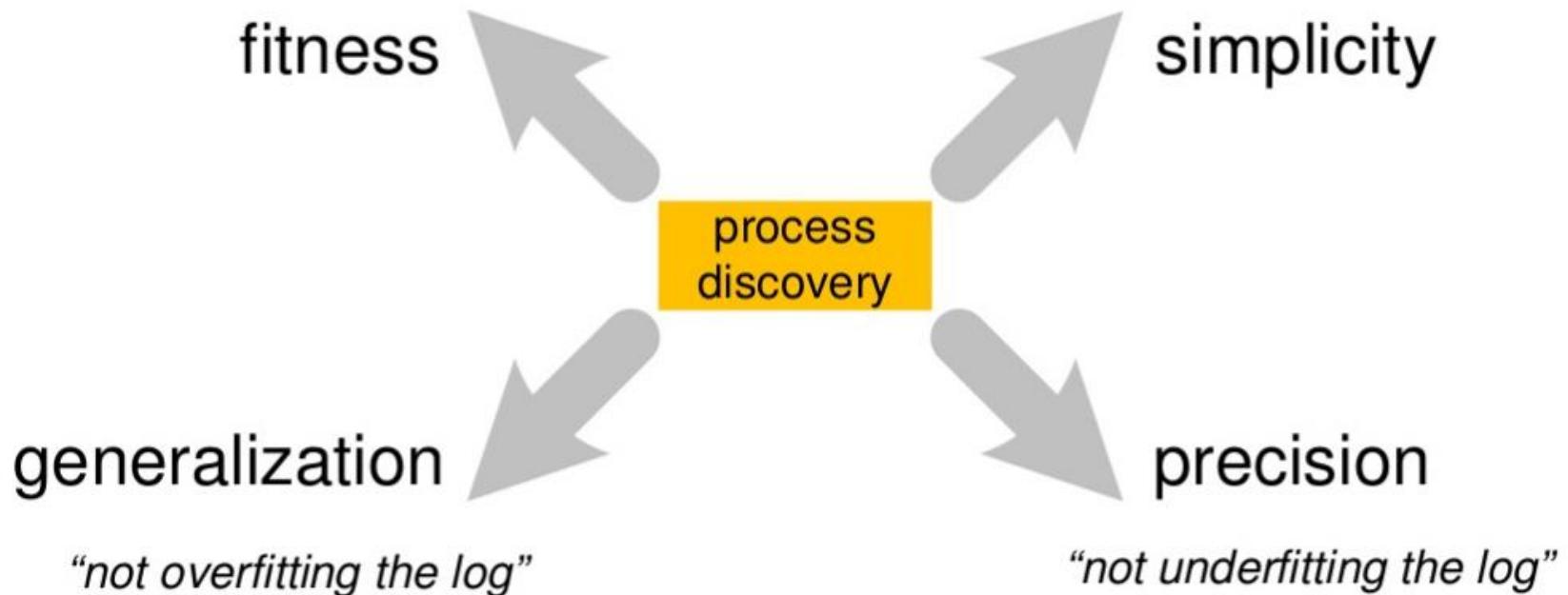
# Enkele Process Mining algoritmes



- Alpha miner
- Heuristic miner
- Fuzzy miner

*"able to replay event log"*

*"Occam's razor"*

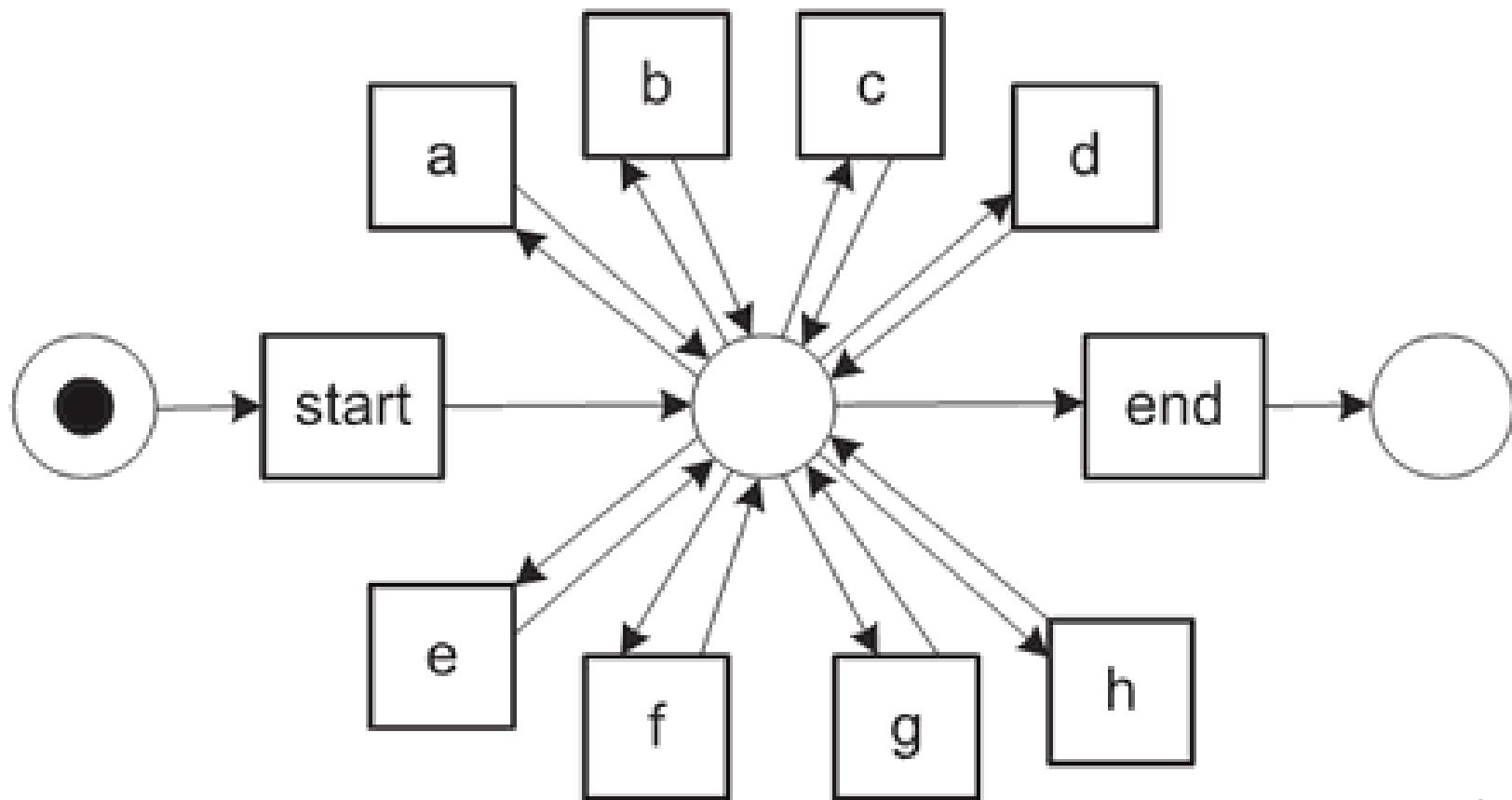


# Fitness & Precision



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- High Fitness – Low Precision

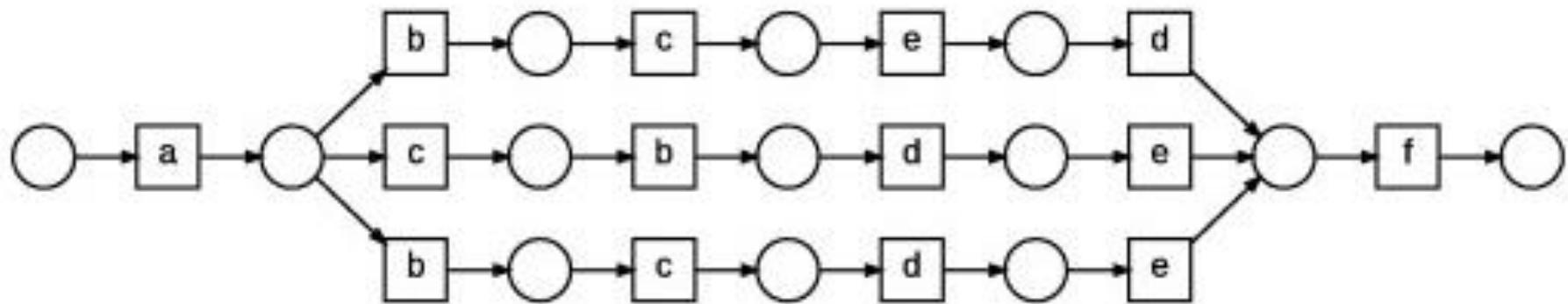




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# Generalization & Simplicity

- Low Generalization – High Simplicity





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# The basics van Process Mining

- Event
  - Registratie van activiteit met de benodigde elementen
- Eventlog
  - Verzameling van events
- Case
  - Set van events behorende tot dezelfde case
- Trace
  - Volgorde waarin activiteiten door één case zijn doorlopen
- Proces model
  - Samenvoeging van alle traces uit een eventlog

- Event

Case	Activity	Timestamp
1	A	9:02



- Eventlog



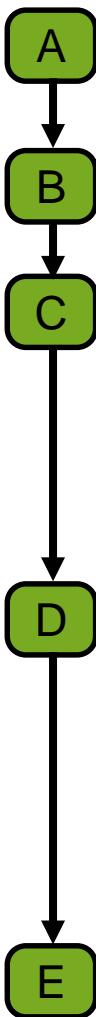
Case	Activity	Timestamp
1	A	9:02
2	A	9:04
1	B	9:08
1	C	9:15
3	A	9:21
2	C	9:37
3	B	9:40
2	B	9:50
1	D	10:10
2	D	10:17
2	E	10:29
3	C	10:52
3	D	11:12
1	E	11:14
3	D	11:29
3	E	12:55

- Case → Trace



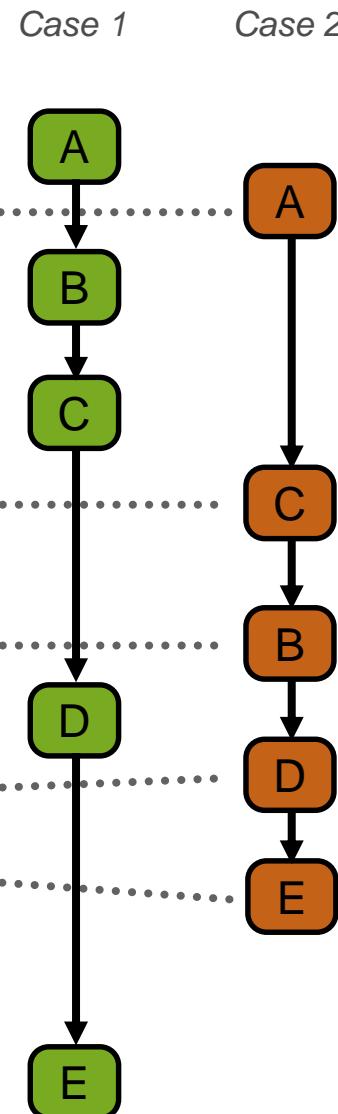
Case	Activity
1	A
2	A
1	B
1	C
3	A
2	C
3	B
2	B
1	D
2	D
2	E
3	C
3	D
1	E
3	D
3	E

Case 1



- Case & Trace

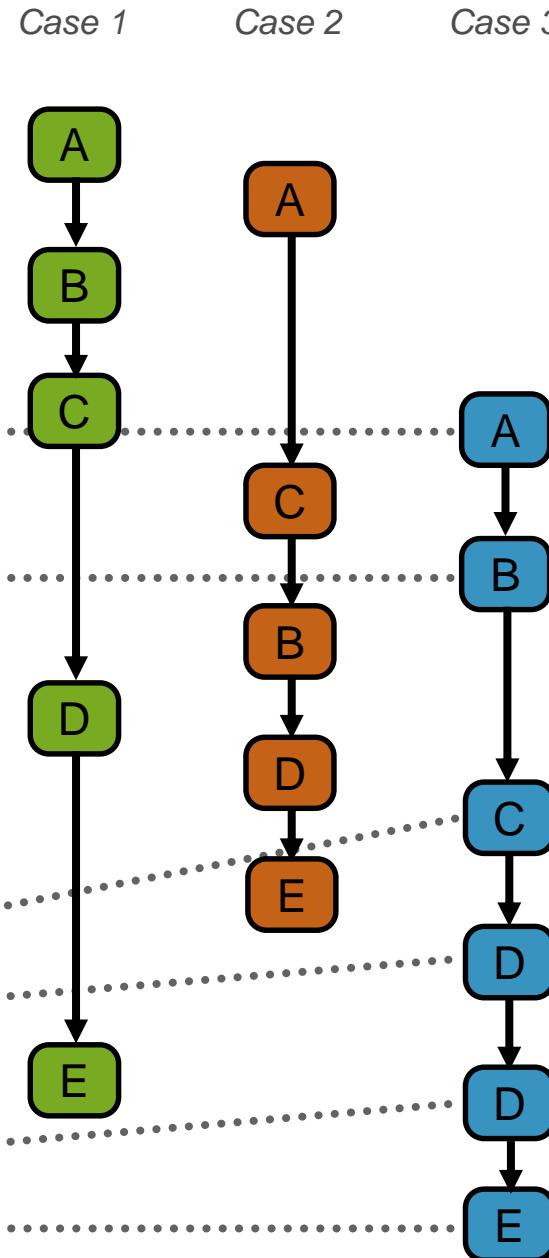
Case	Activity
1	A
2	A
1	B
1	C
3	A
2	C
3	B
2	B
1	D
2	D
2	E
3	C
3	D
1	E
3	D
3	E



## • Case & Trace

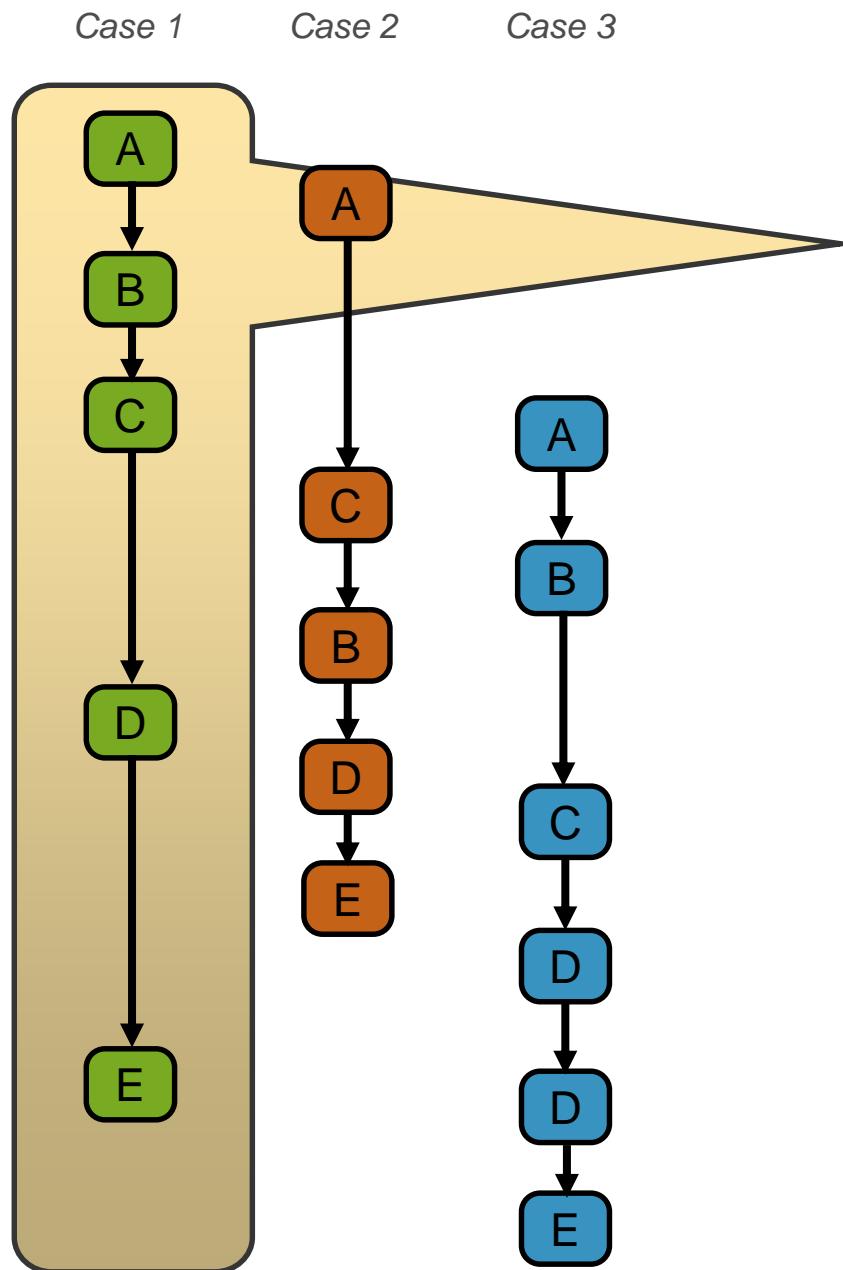


Case	Activity
1	A
2	A
1	B
1	C
3	A
2	C
3	B
2	B
1	D
2	D
2	E
3	C
3	D
1	E
3	D
3	E

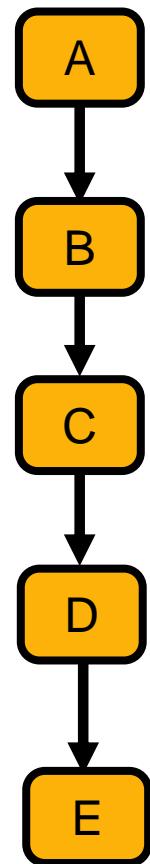


- Trace → Proces model

Case	Activity
1	A
2	A
1	B
1	C
3	A
2	C
3	B
2	B
1	D
2	D
2	E
3	C
3	D
1	E
3	D
3	E

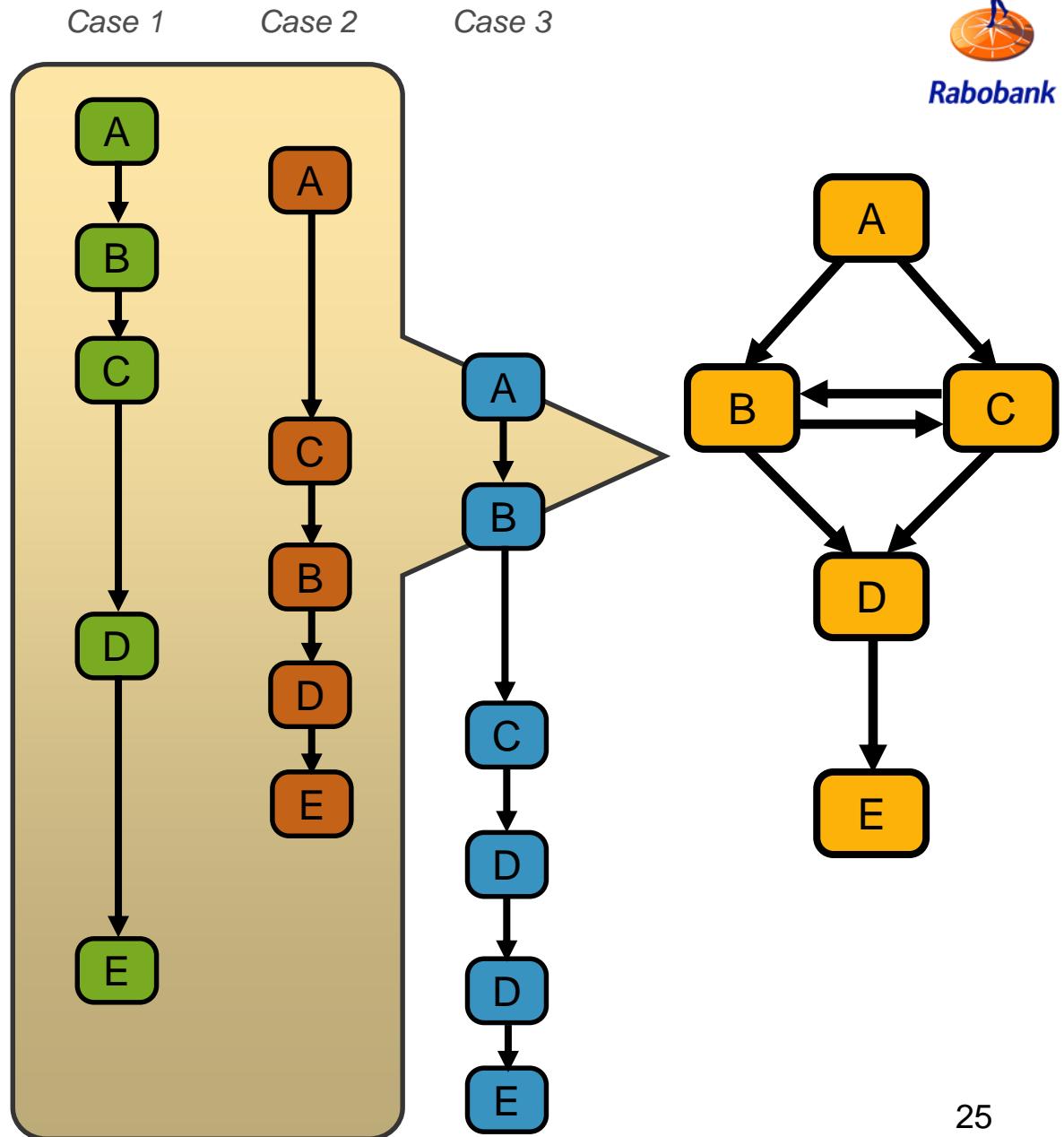


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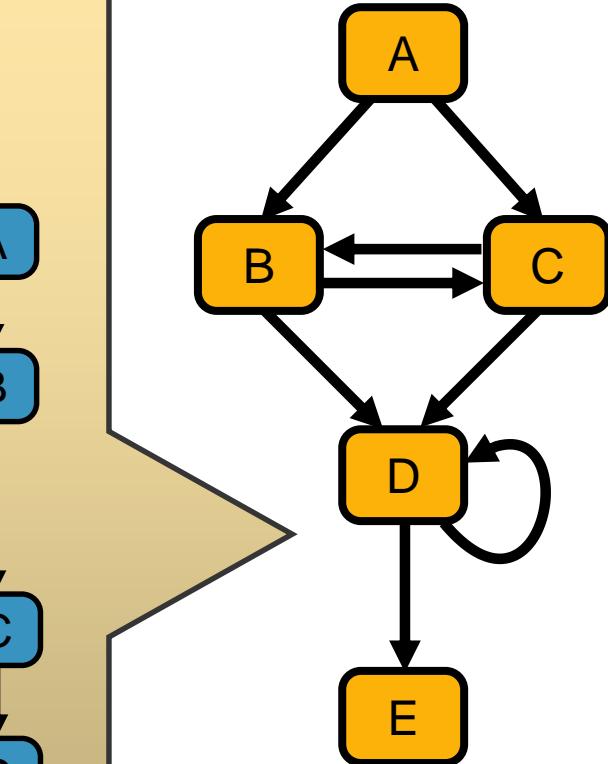
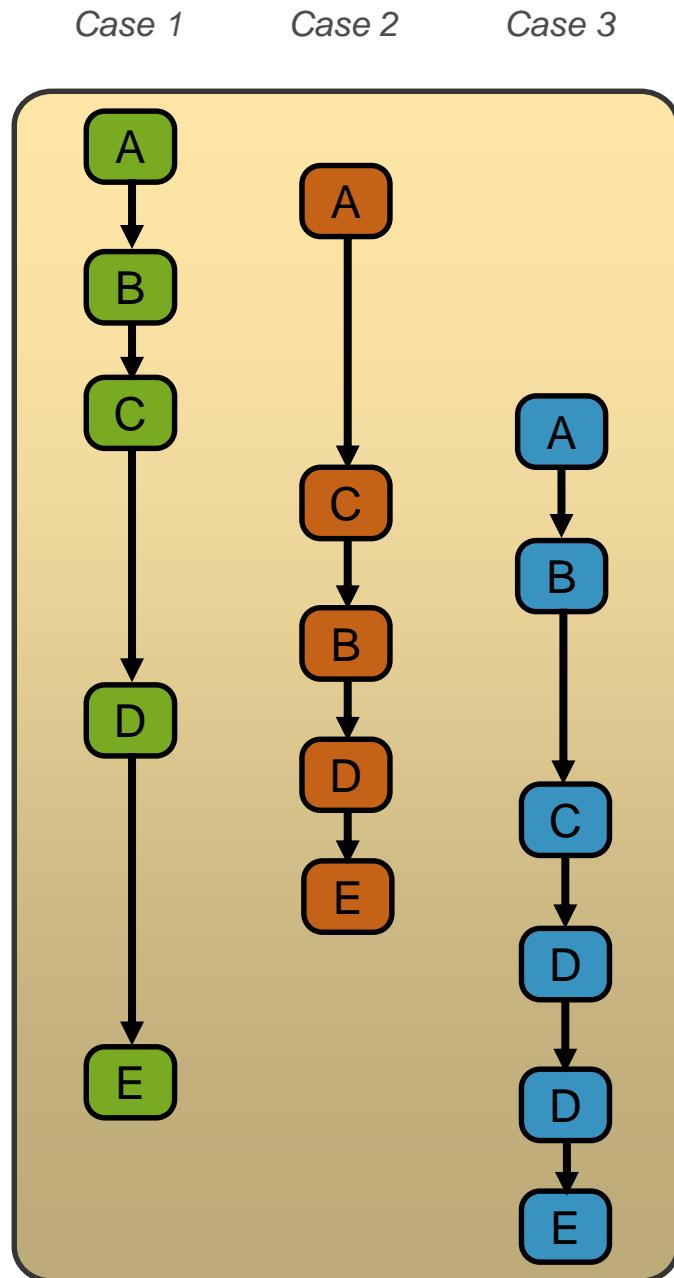
- Trace → Proces model

Case	Activity
1	A
2	A
1	B
1	C
3	A
2	C
3	B
2	B
1	D
2	D
2	E
3	C
3	D
1	E
3	D
3	E



- Trace → Proces model

Case	Activity
1	A
2	A
1	B
1	C
3	A
2	C
3	B
2	B
1	D
2	D
2	E
3	C
3	D
1	E
3	D
3	E



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*Hartelijk dank voor uw aandacht*





Bedankt voor uw enthousiasme!

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